THE

FOUNDRY TRADE JOURNAL

WITH WHICH IS INCORPORATED

THE IRON AND STEEL TRADES JOURNAL

VOL. 52 Thursday, January 24, 1935 No. 962

PUBLISHED WEEKLY.

Subscription Terms: 15s. per annum.
Foreign and Colonial: 17s. 6d. per annum.
All Subscriptions are payable in advance.

All Communications to be addressed to the Editor, the Advertisement Manager, or the Publisher of

THE FOUNDRY TRADE JOURNAL,
49, WELLINGTON STREET, LONDON, W.C.2

Telegraphic Address: "Zacatecas, Rand, London."
Telephone: Temple Bar 3951 (5 lines).

THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF

The Institute of British Foundrymen
The Institute of Vitreous Enamellers
The National Ironfounding Employers' Federation
The Welsh Engineers' and Founders' Association
and
The Foundry Trades' Equipment and Supplies Association

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Smaller Still and Smaller

There was once a time when it was no uncommon thing to be invited to gaze in awe and reverence upon a photograph of some particularly huge casting, surrounded or surmounted by a be-whiskered and bowler-hatted assortment of craftsmen in attitudes of carefully-simulated comfort and nonchalance. The bigger the casting, and, apparently, the more the variety of whiskers and headgear, the greater was the credit for the feat of skill and perseverance. A photograph intended to illustrate an achievement of similar merit to-day would almost require the use of the metallurgist's micrographic camera, so great has been the change from massiveness to intricacy. The era of reverence for the elephantine has been superseded by one of constant striving after the smallest and most intricate casting it is possible to produce.

The general tendency towards the production of lighter and more complicated machines, as exemplified by the typewriter, the automatic slot machine and the vacuum cleaner, has resulted in a demand for tiny castings, often of very complicated sections, which would have been considered impossible of production by the worthy patternmakers and moulders who graced the photographs of thirty years ago. The development of the die-casting alloys of aluminium, zinc and copper, and the reduction in machining operations made possible by the die-casting process, have been contributory factors in this minor revolution in the foundry, but even so, the production of extremely small castings in sand moulds has made considerable headway for certain special purposes. An example which we recently witnessed in course of production was a tiny malleable-iron chain link, measuring not more than half-an-inch over all.

For intricacy of detail, of course, the non-ferrous, pressure die-castings take pride of place. Where stresses are not appreciably severe, the zinc-base alloys have proved of enormous value in meeting the demands of complicated designs, to such an extent that one die-casting may often replace two or three components made by pressing or machining. In some cases, in fact, it has been found possible to replace one or more sheet-metal pressings by a die-casting, with but little increase in weight and a considerable improvement in the appearance of the product. The modern high-pressure die-casting machines have facilitated the production of small, thin-walled castings of complicated shape to such an extent that the most minute machine component can now be produced in the foundry in open and successful competition with the pressed-metal product.

Moulded Iron

When speaking at the luncheon of the British Cast Iron Research Association last autumn, Mr. P. V. Hunter, President of the Institution of Electrical Engineers, suggested that the name of cast iron was suffering in the eyes of engineers for past sins, and that it might be advantageous to change it. He suggested "non-ductile ferrous castings," perhaps in part by way of recognising how difficult it is to frame an alternative. A distinguished engineering contemporary, commenting on this point, has suggested "moulded iron," and, brief as this is, it suggests a material fabricated while plastic rather than molten, somewhat like the plastic materials. We have a proverb about giving a dog a bad name, and it must be agreed that a bad name is difficult to live down, just as a good one is difficult to live up to. If, however, metallurgists and foundrymen did succeed in giving a universally recognised new status to cast iron, they would feel doubly triumphant; no one who knows doubts that it has in the last decade acquired a new status. The difficulty is to get it home to engineers and designers, whose pocket-books apparently sadly need revision. One of the difficulties of a change of name is that for a variety of purposes common cast iron will continue to be used, and hence the name cast iron must be retained, if only for those purposes. Just as our friends the makers of foundry pig-iron have recognised the quality for improved pig-irons by using the term "refined," perhaps we could give the phrase "refined cast iron" a chemical, physical or structural significance. Many terms, such as "high strength," "high-duty," and so forth are also used. The same difficulty with the name has been responsible in large part for the introduction of trade names for special alloys. The practice is understandable, and even commendable, and in the long run may actually bring about the very change we desire, because engineers as a body are not likely to see grow up a forest of proprietary names for what in essence is the same quality of material, particularly when so many varieties of qualities are needed. We may, therefore, look to the problem to solve itself on these lines.

C

Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents]

The Oldest Grey-Iron Casting

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—In answer to Mr. Williams' query, the oldest casting is to be found at the Barbican, Lewes, and is a Roman statuette of a man. Sir W. C. Roberts Austen, of the Mint, and Dr. Kelner, of the Arsenal, having taken a drilling both declared it to be cast iron. Mr. Reed, Keeper of the Roman Section at the British Museum, recognised the specimen as of Roman form, and it has been proved to be similar to the man in the Marley Horse group of bronze in front of the Quirinal at Rome. Charles Dawson, F.G.S., declares it to be the oldest-known example of cast iron in Europe.

In the Barbican may be found many firebacks, showing the stages of progress in making open-sand moulds, a rope border and rope numerals (Roman) being the simplest. Another fireback shows the ironmaster Richard Leonard in his furnace at Brede, Sussex, dated 1636.

In 1266 a grant was given to the people of Lewes to raise money to repair the town walls after their battle by levying tolls on the carriage of iron from the Weald; this, obviously, suggests a flourishing trade in iron at that period.

[*Note.*—The iron grave slab referred to by Mr. Williams is at Crowhurst Churchyard, Surrey. Anyone taking holidays at Brighton or Hastings can spend a pleasant half-day at the Barbican, Lewes, where are displayed many cast and wrought specimens of historic iron.]—Yours, etc.,

W. H. MOORE.

Ellesmere Park,
Manchester.
January 16, 1935.

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—In further reference to Mr. Williams' letter in the issue of December 20, it would appear very unlikely that any dated specimens of early cast iron are to be found. For a long period the only direct use of cast iron, other than sows for forging into wrought iron, was at first balls for the built-up guns of wrought iron or cast-bronze guns, and later the early cast-iron guns. Neither of these can be dated. So far as this country is concerned, the earliest specimens, if their provenance can be relied on, are the cannon balls from the wreck of the "Mary Rose." This ship was laid up in 1514, and the inventory of her armament then taken includes *inter alia* "cast pieces of iron," "shot of iron," "great murderers of iron" (a kind of mortar to shoot grape). Cast-iron shot was supplied for another ship in 1513, from Hartfield, Sussex. The "Mary Rose" was sunk at Portsmouth in 1545, and some of her armament recovered in 1846; one ball is at the Rotunda Museum and another at the Royal United Service Museum. I fancy there is some mistake as to the dating of the fireback at Lewes as 1406, and Beck does not agree with the dating of the Burwash grave slab as 14th century.—Yours, etc.,

ERNEST STRAKER, F.S.A.,
Author of "Wealden Iron."

"Friarsmead," Pilgrims Way,
Reigate.
January 21, 1935.

Blowholes

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—Mr. Tyrie is to be congratulated on his admirably comprehensive analysis of the cause and cure of defects in iron castings appearing in your issue of the 17th inst. Attempts to elucidate the fundamental causes of defects and explain them in language readily understood are, when the explanations are correct ones, of the utmost value to the practical foundryman, and in this respect Mr. Tyrie's Paper will repay careful study.

The Paper contains the first published reference which I have seen to blowholes containing metallic inclusions, and the following particulars of a personal investigation of this defect may be of interest, as it leads to a rather different conclusion as to the origin of these beads. Two or three years ago I had collected quite a number of these beads, and some of the larger ones were big enough either to be drilled or powdered for analysis. As a result of the analyses it was found that in each case the beads had a considerably higher total carbon and phosphorus content than the base metal in which they were found, whilst the sulphur and manganese contents were lower, silicon being the same in each case. The following figures are from one such example and are typical of the others tested:—

	T.C. Per cent.	Si. Per cent.	S. Per cent.	Mn. Per cent.	P. Per cent.
Base metal	3.19	1.18	0.107	0.49	0.048
Bead ..	3.95	1.20	0.045	0.44	0.079

This seems to be conclusive evidence that these beads are extrusions of what one might perhaps be permitted to describe, for want of a more adequate term, as "eutectiferous" liquid metal into a blowhole, and are caused by the pressure of graphitisation on the residual liquid metal during solidification. It would appear, then, that necessary conditions for the appearance of the beads are the pre-existence of a blowhole and the intervention of solid metal between the heads and runners and the liquid metal under pressure, preventing the transfer of the pressure back to the heads and runners. This being so, it follows that the foundryman, if he wishes to avoid blowholes, must avoid dull metal altogether, and not rely upon careful pouring and the avoidance of spills with dull metal.

It is by no means unknown for extrusions of this kind to be found on the external surfaces of a casting flattened against the sand, where for some reason cooling is retarded. On the other hand, I have yet to find a blowhole in white iron with the slightest suspicion of the formation of a bead of this kind, the reason being that, as there is no graphitisation to cause expansion, the necessary pressure for the formation of the bead does not occur.—Yours, etc.,

J. K. SMITHSON.

Stillington, Stockton-on-Tees.
January 19, 1935.

Factors in the Economic Conduct of Vitreous Enamelling

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—I read with interest the comments of Mr. J. H. D. Bradshaw contained in your issue of the 10th inst., relative to Mr. J. H. Coupe's Paper published in your issue of the 27th ult. I shared Mr. Bradshaw's astonishment when I read the statement contained in the report on Mr. Coupe's Paper, that two very large firms had changed over to steel shot only, and found that the acid-resisting properties of their enamels had disappeared. I feel that, in the interests of the enamelling industry in particular, we should invite Mr. Coupe to persuade the two firms in question to put their experience and findings into print, or, better still, to submit them for discussion at one of the sectional meetings of the I.V.E., whether held in Birmingham, London or Manchester.

As far as our own experience goes, we definitely abandoned the use of flint over two years ago, and have had no reason even to consider a reversion; in fact, we find that we certainly get a much more effectually-cleaned surface by the use of clean angular steel shot, despite the initial difficulties experienced with labour, who, all too frequently, take exception to new innovations.

I would suggest to my friend Mr. Coupe, and any other gentleman of a similar opinion, that they take a casting that has been sandblasted by flint, and expose one-half of that casting to the effects of angular steel shot at 60-lb. pressure, and I feel sure that they will then more readily appreciate the difference in the results obtained. I, personally, feel that this subject, and that of sandblasting equipment generally, is of vital importance to those engaged in the enamelling process, particularly on cast iron, and that, further, the mechanical equipment available leaves very much to be desired, and can, I suggest, obviously be improved in the interests of even better results and the obtainment of lower production sandblast costs.—Yours, etc., W. TODD.

"Kayliam," Manor Road,
Stechford, Birmingham.
January 21, 1935.

Catalogues Received

Fans and Blowers. The receipt of two folders dealing with fans and blowers from Messrs. James Keith & Blackman Company, Limited, of 27, Farringdon Avenue, London, E.C.4, presents us with another opportunity of expressing our prejudice against this particular form of publicity as a selling agent for serious engineering plant. We are of opinion that broadsheets and folders are best used for selling consumable commodities, as the frequency of entering the market is relatively high, whilst for plant the reverse is the truth. Of their type, these two examples are excellent, well printed, excellently illustrated, and covering a wide range of industries. The larger one, that dealing with fans, has a very clever introduction—"Air costs nothing—Yet"—and, on opening, the advertising message is disclosed.

Gas-Fired Crucible Furnaces. The Morgan Crucible Company, Limited, Battersea Works, London, S.W.11, have sent us an advance copy of a new catalogue devoted to gas-fired crucible furnaces. Because as a firm they are equally interested in selling coke- or oil-fired plants, the data assembled within these twelve pages can be considered as authoritative, and we would direct attention to pages 6 and 7, which very intelligently set out in the British and metric systems the daily output and the gas consumption for four or five sizes of furnaces when melting aluminium, brass, bronze, copper and nickel brass, and cast iron and cupro-nickel. Such information does put the user in an excellent position to estimate within very close limits the operating costs, as the cost of raw materials, fuel and labour, are all known, whilst the life of the pots is nowadays fairly well established.

The design of the furnaces shown is extremely workmanlike, neat and simple, and indicates a profound knowledge of the best accepted principles of metallurgy and rational combustion. The catalogue is divided into six sections, and it well merits careful preservation for the exceptionally useful data it carries.

MESSRS. RUSTON & HORNSBY, LIMITED, are making an issue of £250,000 4½ per cent. debenture stock, which is being offered to holders of the 6 per cent. first mortgage debentures on exchange terms.

Selecting Foundry Conveying Equipment*

By R. J. HEISSERMAN,† Philadelphia, Pa., U.S.A.

The dictionary states that to invest is "to lay out (money or capital) in the purchase of property for permanent use as opposed to speculation," or "to use money for any purpose from which profit is expected," and that investment is "the act of investing capital productively."

Opportunities for investment are many and varied. The layman, with his lack of experience, will be drawn by the "glitter" or promised large, immediate return for an investment. The seasoned investor will first try to determine its soundness as well as to be assured that it will prove reasonably profitable. With this assurance, he is willing to accept a lower rate of return on his money. The layman, who falls for the promised high return, unknowingly, is speculating.

A like comparison can be made in the selection of foundry conveying equipment. Inexperienced foundrymen frequently are tempted to install low-priced equipment that promises all the returns of the proved, highly-developed system. There have been cases where these speculations, gambles, or experiments have worked after a premium he pays over first cost of the poor investment could be classed as insurance, at a low rate, covering a guarantee of successful operation.

A Concrete Example

As an example of good investment, let us consider the steps leading up to the selection of a continuous moulding and pouring unit for a grey-iron foundry in which duplicate floor moulding is being done with one heat of about 40 tons being poured in an afternoon. Several reasons have caused this foundry to consider mechanical methods; keen competition, the need for increased production without increasing floor space, better working conditions, uniformly improved quality of product, any others that go hand in hand with a systematic, orderly, continuous moulding unit.

The leading conveyor manufacturers who specialise in foundry equipment are called in for consultation. After a survey to determine whether the volume is sufficient to warrant the installation of continuous moulding and pouring equipment, and whether the product is suited to mechanical handling, the prospect should visit various foundries where a similar product is being produced mechanically.

Lay-outs are next submitted. This is a very important step in securing a good investment, as a system not properly balanced in operation, although made up of good individual parts, may cause confusion by overlapping of traffic, and thus not gain the desired results. Consideration must be given to the relation of the pouring zone to the cupolas, the moulders to the core rooms and the shakeout to the cleaning room. The number of moulders must be balanced with the length of pouring and cooling zones, and if cope and drag moulding machines are used, their relation to each other must result in the best operating conditions for moulding, setting of cores, closing and placing of complete moulds on the conveyor with the least manual effort. Provisions must be made for returning the flasks to the moulders and storing them in a convenient location for re-use.

Forethought is Essential

Many other details of operation that go to make up a successful system must be considered, such as the number of moulds and amount of sand to be handled per hour. Unless the client has had previous experience with mechanical equipment, he is likely to under-estimate the possibilities of his moulders when aided by suitable conveying equipment, and fail to provide sufficient capacity for the system to obtain the maximum return.

Consideration also should be given to the possible addition of other units or the mechanical handling of the castings to the cleaning room at a later date. So that these additions will have all advantages to be gained from the original installation, forethought of future additions in the planning stages may save considerable money, time and shutdowns when additions to the system are installed.

The introduction of new sand into the system, and the removing of refuse, including the separation of the magnetic material from the refuse, should be performed at the most convenient location to minimise handling to and from the system. Provision or means for circulating the sand to and from storage and the preparing and distributing units should be made. This is called a closed-circuit system.

This type of system has advantages, such as taking care of the overflow sand from the distributing conveyors, re-working the sand after the system has been shut down for a length of time, etc. A small continuous amount of prepared sand discharged from the distributing conveyors mixes with the hot sand in the shakeout conveyors, thus providing a cooling and pre-tempering beneficial to the sand. It also provides seasoning in the storage tank. The surplus sand handled also is an assurance that the moulder's sand hoppers always will be full.

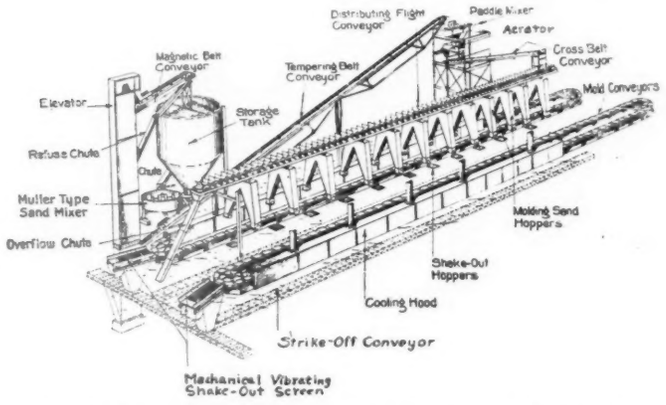

FIG. 1.—DIAGRAMMATIC DRAWING OF A CONTINUOUS MOULDING AND POURING UNIT FOR A GREY-IRON FOUNDRY.

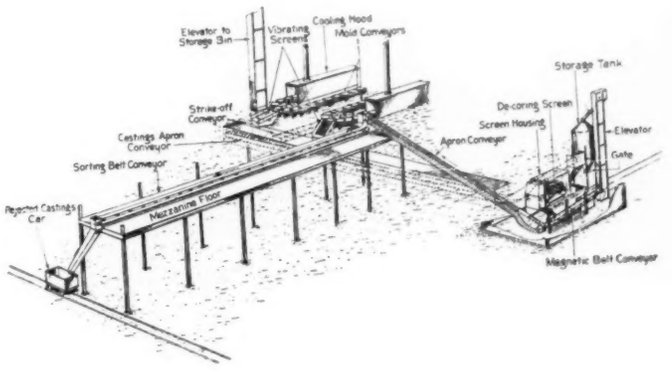

FIG. 2.—DIAGRAMMATIC DRAWING SHOWING HOW CASTING HANDLING EQUIPMENT WAS ADDED LATER TO ORIGINAL INSTALLATION SHOWN IN FIG. 1.

fashion for a short period. Then the losses from poor castings (due to improper preparation of the sand), high maintenance cost (due to the use of equipment not suitable to the handling of foundry sand, moulds or castings), and general disorganisation of the entire plant (due to frequent shutdowns for one cause or another) have resulted in complete loss of expected returns.

To rebuild such a system to obtain the proper operation, would cost more than the difference in first cost between the good and the poor installation, while if the unit is discarded, the investment is completely lost. Records show that poor equipment has caused complete failures, and it has taken years for the companies that have gone through such an experience to regain their faith in mechanical handling equipment sufficiently to consider another system.

To complete the comparison there is the seasoned investor, who has had previous experience with foundry conveying systems, or who has made a thorough study of those in operation, and as a result recognises the fact that proper engineering and quality of product must receive first consideration. He desires a system with low operating and maintenance cost that will meet competitive prices with quality castings for many years after installation. The small extra

Co-ordinated Movements

Conferences between the investor and his staff, with the sales engineers, to ensure co-ordination of actual operating conditions with the requirements of a continuous system, should result in the most satisfactory lay-out possible for the conditions. A proposal covering all the units that go to make the complete system then can be submitted for consideration from an investment standpoint. Many types of conveying and preparing units are used in foundry systems, each of which, when correctly applied, properly performs the duty expected of it. The list shown in Table I gives some idea of the large variety from which to choose.

Other types of conveyors are used successfully in foundries for handling such materials as coke, pig-iron, scrap, limestone, powdered coal, hot metal, refuse, etc., but, since these are not directly interlocking with the mould, sand and castings handling subject of this Paper, no further reference will be made to them. Several propositions are received by the investor, and it is proposed to look over his shoulder whilst he selects the one that finally is purchased and note the units proposed. Fig. 1 shows a typical

* Paper read before the Fifth International Foundry Congress, held at Philadelphia.

† Engineer, Link-Belt Company.

installation, and the units included are as follow:—(1) Mechanical vibrating shake-out screen; (2) shakeout hopper with feeder; (3) shakeout reciprocating conveyor; (4) belt bucket-type elevator; (5) magnetic belt conveyor; (6) circular storage tank with revolving plate feeder; (7) Muller-type sand-mixer; (8) inclined tempering belt conveyor; (9) double paddle mixer; (10) conditioner or aerator; (11) cross-belt conveyor; (12) distributing scraper conveyor; (13) moulding sand hoppers; (14) slide-type mould conveyor; and (15) strike-off conveyors.

Other propositions offered, based on various lay-outs or arrangements, will be built of different types or combinations of units than those given, and the investor, in his desire to obtain the equipment best fitted for his purpose, inquires of the sales engineers why they selected the group offered. In other words, the several lay-outs submitted may all be capable of conveying sand and moulds, but when considering the best preparation of the sand and the operating and maintenance cost, the importance of selecting the various units which make up the entire group readily can be realised. Now consider the reasons, item for item, why the foregoing proposition was selected; first by the sales engineer and, second, by the purchaser as a good investment.

Vibrating Shakeout Screen

This type screen is mechanically operated, with few moving parts, which results in low operating and maintenance costs. The intensity of vibration is easily adjusted to obtain maximum efficiency and separation of sand and castings is obtained without excessive core-sand inclusion. It provides preliminary casting cleaning, screens the sand and removes large refuse metal in addition to its function of removing the casting from the mould. This type of equipment requires minimum space and the screen plate can be changed easily. In addition, the unit is readily enclosed and ventilated.

Reciprocating Shakeout Conveyor

This type of conveyor requires a smaller pit than any other type of shakeout conveyor, and there is no pit to clean out, as the pit acts as the conveyor trough. This conveyor cannot be overloaded and provides a uniform feed of sand for the next unit. This feature is accomplished by restricting the opening to the conveyor at the shakeout hoppers. Gates are provided on the shakeout hopper to govern the volume of feed. A preliminary mixing of the sand is provided as it is conveyed and the conveyor action lowers the sand temperature. A minimum number of parts requires lubrication. That operation is performed at the floor line.

Belt Bucket Vertical Elevator

A rubber-covered belt provides the best medium of carrying buckets which elevate the sand vertically, since it withstands abrasion best. A slatted-foot pulley prevents sand building up on the pulley face, thus preventing misalignment of the belt and the open-boot construction makes cleaning and inspection easy. It also prevents clogging. In addition, the ventilated head section relieves sweating and thus reduces the formation of rust inside the elevator casing.

Magnetic Belt Conveyor from Head of Elevator to Storage Tank

In addition to removing the small iron shot from the sand, the introduction of this unit at this point lowers the head of the elevator considerably and delivers the sand with less force into the storage tank than if it were fed direct from the elevator.

Circular Storage Tank

The circular type of storage tank with revolving-disc feeder provides constant, uniform feed from the entire circumference of the tank. Due to the absence of sharp corners and valleys, there is a minimum tendency for the sand to bridge in the tank.

Muller Type Sand Mixer

Provision is made to feed approximately 25 per cent. of the sand required by the system from the tank, through a muller-type mixer, where bonding clays are added. This partial mulling of the entire heap maintains the sand strength which would otherwise be lowered by the constant addition of core sand coming from the castings at the shakeout.

Inclined-Belt Conveyor

In addition to elevating and conveying material, this conveyor provides a place close to the sand-treating man where the tempering operation can be performed. The mulled sand is discharged into a feeder hopper on this conveyor belt. The opening of the hopper is adjustable so that the mulled sand is added uniformly with the sand delivered to the conveyor by the revolving-plate feeder at the bottom of the tank.

TABLE 1.—*Various Types of Units Available for Continuous Moulding and Pouring Systems.*

Shakeouts.	*Strike-Off Conveyors.*
Vibrating gratings operated by air-vibrators.	Belt, reciprocating drag chain or scraper conveyors.
Bumping gratings operated by jolt-machines.	*Screens.*
Bumping gratings operated mechanically.	Revolving trunnion or through shaft types, hexagonal or circular.
Vibrating-screen operated mechanically or electrically.	Breaker trunnion type.
Suspended air-vibrators over stationary gratings.	Vibrating, operated mechanically or electrically.
Manual or crane shakeout over stationary gratings.	*Magnetic Separators.*
Shakeout Hoppers.	Magnetic pulley at discharge of belt or apron conveyor.
Used as storage medium.	Suspended magnets over conveyor.
Used to collect and direct flow of sand to shakeout conveyor.	Suspended magnetic conveyor over sand conveyor.
Shakeout Conveyors.	*Elevators.*
Belt, apron, reciprocating, drag chain and scraper conveyors.	Belt or chain-bucket type.
Drag scraper conveyors.	Inclined apron or belt conveyors.
Pivoted bucket conveyors.	Pivoted bucket-carriers.
Storage Tanks.	Scraper conveyors.
Circular with revolving plate feeders.	*Castings and Cooling Conveyors.*
Rectangular with cutting bar, apron or belt feeder.	Apron conveyors.
Preparing Units.	Overhead trolley conveyors with baskets or hooks.
Paddle mixer or pug mill.	Belt conveyors for castings of temperature less than 150 deg. C.
Muller type mixers.	*Core Handling.*
Aerators.	Belt conveyors.
Reciprocating conveyors.	Trolley conveyors with racks.
Air-exhaust system.	Tray elevator and conveyors.
Distributing Conveyors.	*Mould Conveyors.*
Belt, scraper or reciprocating conveyors.	Gravity roll.
Moulding Sand Hoppers.	Gravity roll with power pusher.
Small or medium capacity, with hand-operated gate.	Power conveyor sliding type.
Large capacity, with apron or belt feeder.	Power conveyor, anti-friction roller type.
Large and small capacity hand shovel type.	

Paddle Mixer

A double-shaft paddle-mixer mixes the wet and dry sand delivered by the tempering belt. It also thoroughly mixes the mulled with the unmulled sand, resulting in a uniformly tempered and prepared sand. The bottom of the mixer is constructed so that it can be dropped for easy cleaning and the renewable tips of the paddle blades are reversible so that they perform double service.

Aerator

This machine is located just in front of the point where the sand is fed to the distributing conveyor so that the benefits of aeration and fluffing of the sand are not lost by repeated handling and storing before delivery to the moulders. The aerator is of the paddle type with the housing arranged to prevent accumulation of sand on the inside.

Belt Conveyor

This conveyor, located beneath the conditioner, collects the finally-prepared sand and delivers it to the distributing conveyor.

Distributing Conveyor

The scraper conveyor was chosen as best for this purpose, since it provides an automatic feed to the moulder's hoppers at all times. Surplus sand is discharged to a shute leading to the shakeout conveyor which returns the sand to the system. The chain and carrying rollers are located at a safe distance from the conveyor flight and trough, thereby protecting them from the sand.

Moulding-Sand Hoppers

These hoppers are of small capacity, as large storage at this point is not necessary with the distributing conveyors continually feeding sand to them. The construction of this hopper is similar to that of a shute with relieving sides and front, which avoids a tendency for the sand to bridge on the sloping side in the back.

Sliding Tray Mould Conveyor

This type of conveyor provides smooth operation for handling delicate snap flasks. Its simple rugged construction and small number of moving parts, ensures low maintenance costs. The open-construction, drop-forged steel chain with no rollers is not affected if metal is spilled on it accidentally at the pouring station. This installation requires minimum space, since it is equipped with small (5-ft. dia.) sprockets at the driving and take-up ends and the speed of the conveyor is regulated easily by changing one small sprocket. As the conveyor, including driving machinery, is located above the floor line, no pits are required.

Reciprocating Strike-off Conveyor

The benefits of the reciprocating conveyor also are utilised for this service, namely, a shallow pit, which requires no cleaning.

After the continuous moulding and pouring system has been installed and has operated for some time, and has proved its efficiency, casting-handling equipment may be installed. This equipment, shown in Fig. 2, might consist of a cooling apron conveyor, which transfers the castings from the shakeout to the de-coring and preliminary cleaning screen: a trunnion-type hexagonal screen which discharges the castings to an inclined apron conveyor, which, after elevating them, discharges the castings to a picking or sorting belt conveyor beside the cleaning mills. Sprues and scrap metal are discharged to a tub at the end of this conveyor. The refuse sand, which passes through the screen, is dropped to a magnetic belt conveyor, which removes all the magnetic material and then delivers the sand to an elevator which, in turn, discharges to a refuse bin.

In addition to comparing the merits of various units, the foundry engineer will make recommendations as to details of the one selected, such as plain babbited or anti-friction bearings, open gear drive or enclosed speed-reducer unit running in oil and directly connected to the motor, number of plies and thickness of rubber cover of conveying belt, total horse-power required to operate the system, thickness of steel plates and shapes in hoppers, bins, troughs and structural work, and many other details of equal importance.

Unless these details are thoroughly investigated at the time the contract is let, there is the possibility of not discovering their importance until the high maintenance costs call them to attention after the system has been in operation for a comparatively short time. The time required

(*Concluded on page* 82.)

The Roll Foundry of C. Akrill & Company, Limited

PROGRESS OF A CENTURY-OLD CONCERN

Behind the Gold's Green Foundry lies a record of almost 100 years of uninterrupted activity. The original foundry was laid down on the present site, Gold's Green, West Bromwich, Staffs, by Taylor Bros., in 1840, and from the outset the works were actively engaged in the production of rolls, though unfortunately records are not available as to when the first chilled roll was made. The works were acquired by Mr. Charles Akrill in 1870, and records are available to show that so far back as the date named some of the largest chilled rolls then in service were the products of the Gold's Green Foundry. It is also established that the first steel sheet made in this country was produced in a mill equipped with Akrill rolls. The bloom for this sheet was made at the Panteg Steel Works. It was 24 in. long, 6¼ in. wide by 3 in. thick. It was heated in a ball furnace and rolled into a sheet at Thompson & Hatton's Bradley Tin Plate Works at Bilston.

The business of Mr. Charles Akrill was converted into a company under its present style of C. Akrill & Company, Limited, in 1902. The policy of the company has been consistently progressive. It might, indeed, be said that the site of the works is all that remains of the original. Some of the buildings are still in service for stores and the like.

The foundry and its auxiliaries, the machine shop, etc., are housed in modern buildings, and their equipment has been kept well in line with the most modern practice. There has been no hesitation to scrap machines or plant, however efficient such machine or unit might be considered in relation to its initial efficiency, when the management have been satisfied that improvements have been effected in machine or apparatus which would enable them to give a higher quality of product, or reduce the cost of production. At the same time they have resolutely refused to attempt the latter at the expense of the former.

Early Use of Pulverised Coal

In many respects they have been pioneers; indeed it was at the Gold's Green Foundry that the first pulverised-fuel firing unit for melting cast iron for roll-making was installed. Satisfied that pulverised-fuel firing enabled the most accurate control to be obtained when melting even for the production of rolls, the company installed a Resolutor unit, by Clarke, Chapman & Company, to work in conjunction with a 7-ton furnace in 1927. Naturally enough, the innovation was not immediately successful; the difficulties were, however, finally overcome and the installation was made practically and commercially successful and now the whole of the melting is done with pulverised fuel.

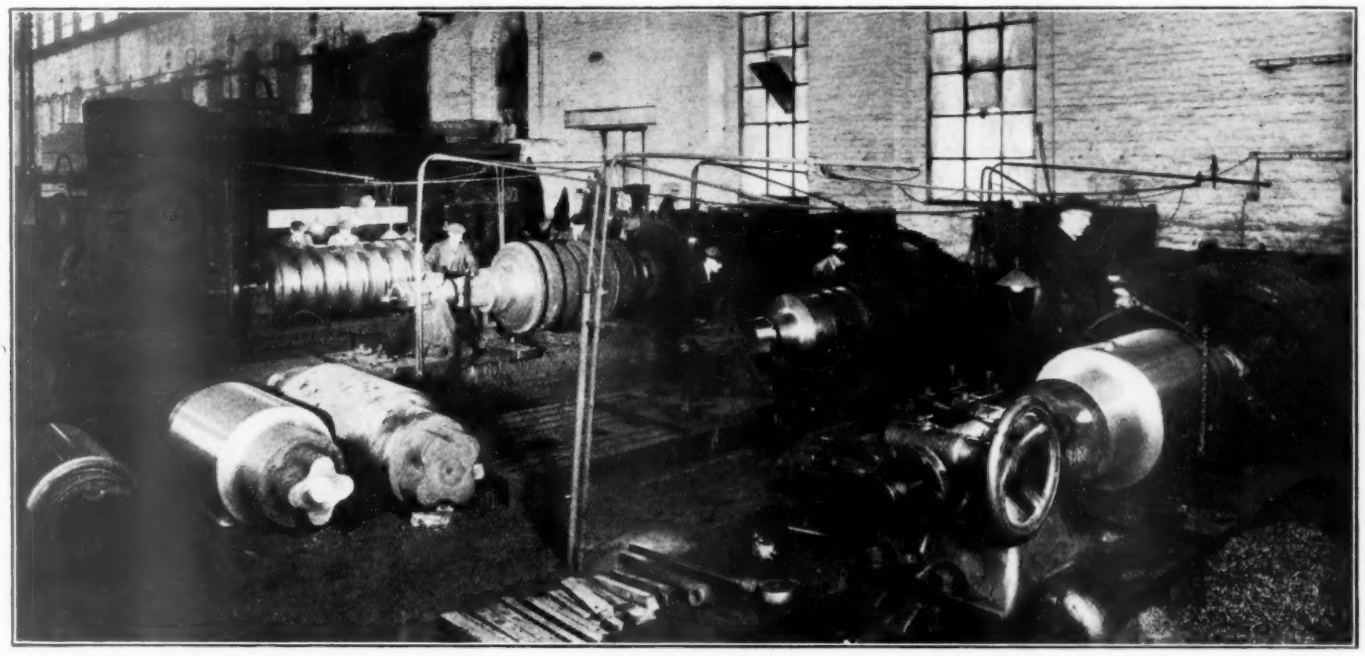

FIG. 1.—SHOWING PART VIEW OF MACHINE SHOP.

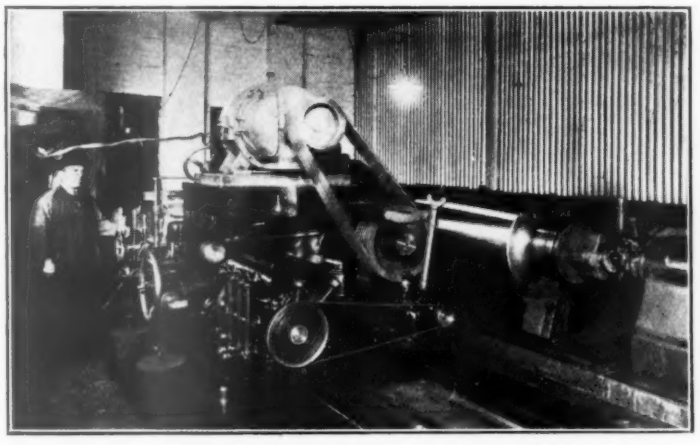

FIG. 2.—SHOWING SHEET ROLL ON GRINDING MACHINE.

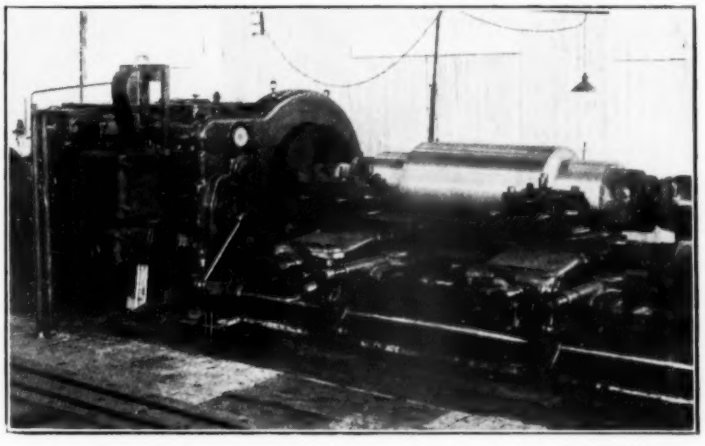

FIG. 3.—SHEET ROLL MOUNTED ON HIGH-SPEED LATHE.

Types of Rolls Made

The company specialise in high-grade rolls, which may be divided into various classes:—(*a*) Straight carbon, chilled, hard, mild and soft chilled rolls from a few hundredweights in

weight up to 42 in. dia. plate rolls weighing 25 tons when finished machined; (*b*) grain rolls for all sections; and (*c*) patent-process alloy grain rolls which are specially treated, ensuring

ing properties. In verification of this statement, the following is an analysis of 12 passes in a Lester's patent-process alloy grain roll, the passes varying from $3\frac{5}{8}$ in. to $2\frac{3}{16}$ in., the roll

of chilled rolls, from a few hundredweights up to the largest section roll used in this country. (*c*) Alloy chilled and part-chilled rolls, Ni-hard and other qualities where a very much harder

FIG. 4.—VIEW IN FURNACE BAY SHOWING PULVERISED-FUEL EQUIPMENT.

either a wholly pearlitic wearing surface or, if desired, a much harder pearlitic cementitic structure, thereby giving a remarkably long life in the mill and a perfectly true section.

having a diameter of 24 in. and a length of barrel of $46\frac{1}{2}$ in. The combined carbon percentages were as follows (per cent.):—(*a*) 1.28, 1.28, 1.28, 1.13, 1.17, 1.20, 1.14, 1.16, 1.21, 1.32, 1.25

wearing surface is called for than is obtainable with straight carbon quality.

In Fig. 5 we illustrate a pair of chilled finishing rolls for rolling mills (A). These are of a very

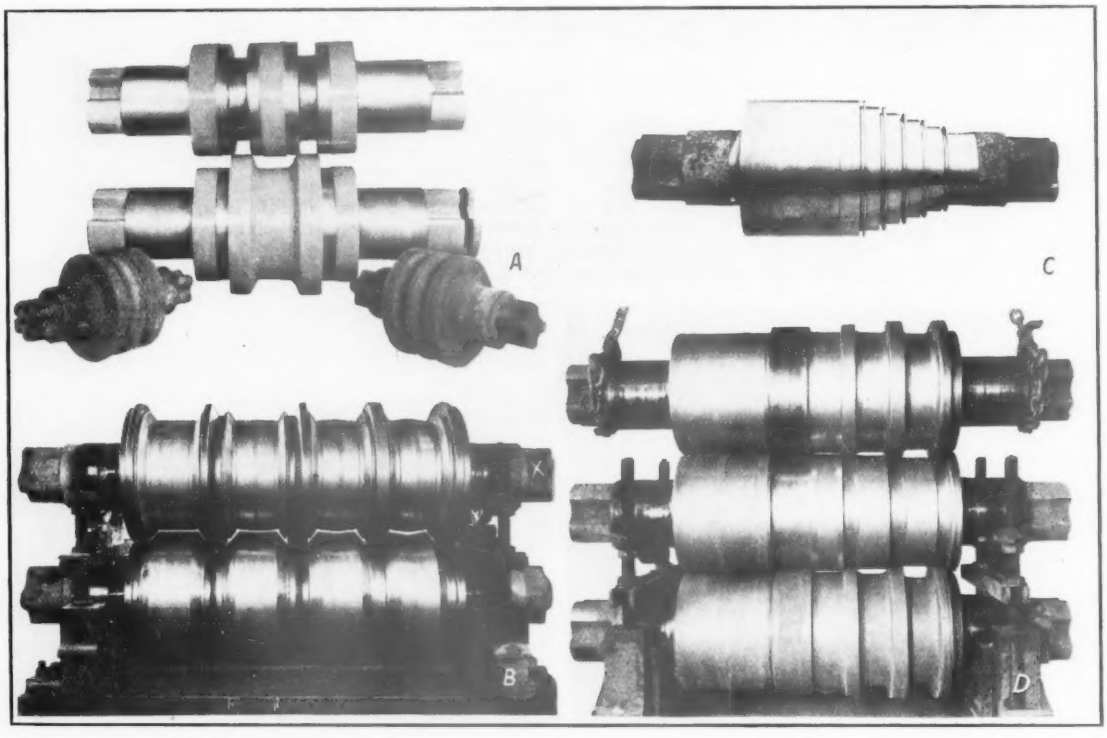

FIG. 5.—A=PAIR OF CHILLED FINISHING ROLLS FOR SPECIAL RAILS; B=PATENT PROCESS ALLOY GRAIN ROLLS FOR ROLLING PILING SECTIONS; C=ROLL MADE FOR SPECIAL PURPOSES; D=SET OF PART-CHILLED ROLLS FOR ROLLING SHEET BARS.

Due to control of composition, the whole roll body is almost fully pearlitic, containing fine and evenly-distributed graphite flakes, ensuring maximum strength, toughness and shock-resist-

and 1.27; (*b*) 0.72, 0.76, 0.76, 0.78, 0.79, 0.90, 0.88, 0.78, 0.80, 0.80, 0.80 and 0.78. It may be noted that upwards of 40,000 tons of this type of roll have been made, weighing, as in the case

special type, which are not used in this country; the actual depth of the chill is 4 in. The two small rolls are chilled rolls for rolling angles;

(*Concluded on page 82.*)

Defects in Iron Castings: Their Cause and Cure

By T. TYRIE

(*Concluded from page* 62.)

In a great measure the elimination of sand and dirt holes becomes a matter of care on the part of the moulder provided the sand he is supplied with is of a suitable nature for the class of work on hand, and the type of moulding, *i.e.* hand or machine. Table I gives sand control test specifications for light to medium weight general engineering castings, the figures being derived by the use of sand testing apparatus recommended by the Sand and Refractories Sub-committee of the Institute of British Foundrymen and illustrated in Fig. 14. It cannot be too strongly emphasised that control of moulding sand is of almost as great importance in the production of good castings as is the control of metal, although the former factor is only now being realised, and it is only in controlling the sand that the laboratory can be of service in this matter. Fig. 15 shows in graphical form the dirt loss in greensand work in proportion to the strength of the sand while Fig. 16 shows a similar comparison for dry-sand work; both diagrams taken from the work of Dietert in America.

TABLE I.—*Sand Control Test Specification for Light to Medium Weight General Engineering Castings.*

Test.	Green sand.	Dry sand.
Per cent. moisture ..	6.0—7.0	8.0—10.0
Green compression A.F.A. lbs. per sq. in.	4.5—6.0	4.5—6.0
Green permeability A.F.A. Number	60–80	—
Dried compression A.F.A. lbs. per sq. in.	50 minimum	120 minimum
Dried permeability A.F.A. number	—	80 minimum
Gas evolved at 1200 deg. C. cub. ft. per cub. ft. of sand	120 maximum	60 maximum

Given then proper sand for the job the production of castings free from sand holes is largely a matter of supervision. Care should be taken to clean out the mould thoroughly and any loose sand in runner gates and bushes removed. In preference the runner and riser bushes should be made up in the top part before closing the mould since even the finest of workmen may allow a little sand to fall down the gates. The presence of loose sand in the mould has been stressed considerably and quite intentionally because a close examination of many castings showing defects due to sand holes has convinced the author that the majority of these have arisen through loose sand. It is well known that whenever a moulder sees a sand hole in a casting he looks for a bump to indicate from whence the sand causing the hole has dropped or been washed away. In the majority of castings personally examined absolutely no indication of such a drop or break-away could be found which leads to the assertion that loose sand is responsible in these cases and careful work alone can eliminate this.

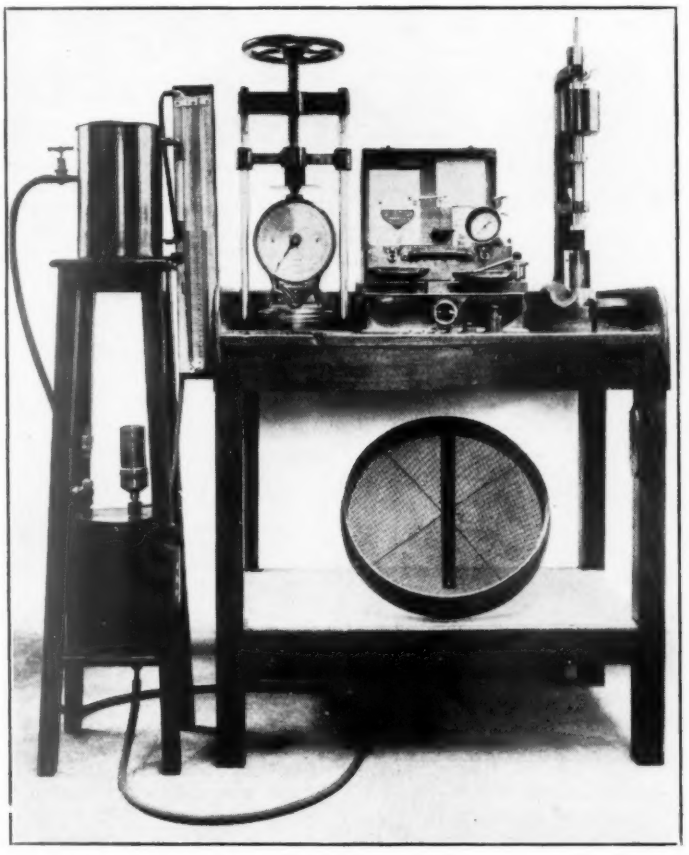

FIG. 14.—SAND-TESTING APPARATUS RECOMMENDED BY THE I.B.F. SUB-COMMITTEE.

Slag Holes

This defect may arise from a variety of causes, and its entire elimination is a matter of considerable difficulty, if, indeed, it can be entirely eliminated. The first and obvious source of slag is from the cupola, but under properly-worked conditions the amount of slag flowing into the ladle at the cupola spout should be nil or, at least, very little, and if the metal is as hot as it should be coming from the cupola the separation of entrapped slag will be relatively complete and the slag easily removed.

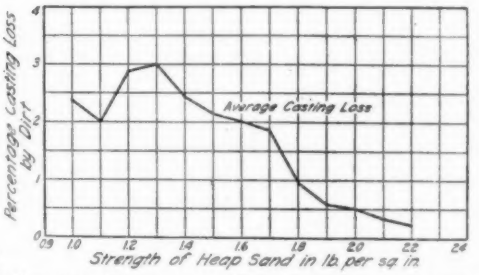

FIG. 15.—REDUCTION OF DIRT LOSS BY INCREASING STRENGTH OF HEAP SAND (DIETERT).

Another source is the refractory lining of the ladles themselves. The gradual formation of oxide of iron on the ladle walls has the unfortunate effect of lowering the melting point of the refractory used for lining the ladle, and where high-melting temperatures are the practice the net result is the production of slag through the melting of the refractory. It is essential that precautions be taken to prevent this slag from entering the mould, and towards this end it would be an advantage in small work if thin-tinned iron discs, with a few small holes punched in them, be placed over the runner gates in the bush, as shown in Fig. 17. These will resist melting and support the metal long enough to let the basin become filled, and then on melting allow the metal to enter the mould in a clean

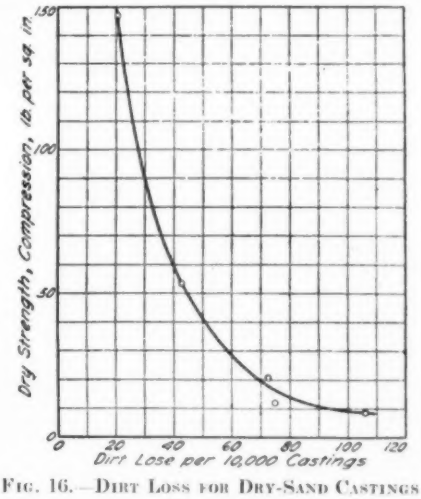

FIG. 16.—DIRT LOSS FOR DRY-SAND CASTINGS (DIETERT).

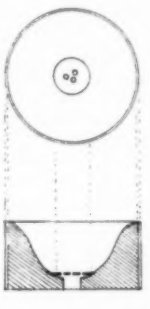

FIG. 17.—SUGGESTED METHOD FOR ENSURING CLEAN IRON IN CASTINGS.

stream. It is usually just at the beginning of the pour that slag finds its way into the mould. For larger work the gates should be closed with plugs or stoppers, which may be lifted out whenever the basin is full, and it is an advantage to hold the plug, after lifting off the gate, so that it penetrates the surface of the metal, thereby steadying the floating slag and preventing its being sucked down by the rush of metal. Another step which is advantageous in preventing slag gaining access to the mould is the use of what has been described in America as Tea-spout ladles, whilst Fig. 18 gives an idea of how the ordinary foundry ladle may be easily converted into the tea-spout type with little difficulty, this illustration being taken from a recent issue of "The Foundry."

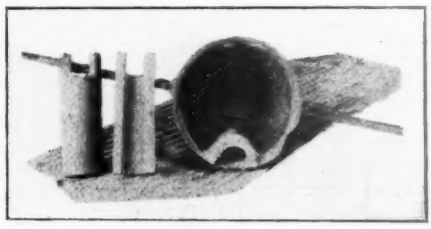

FIG. 18.—SHOWING CONVERSION OF A SHANK INTO A TEAPOT LADLE.

In spite of such precautions, however, slag will occur in castings to a small extent, arising from a source over which one can exercise little or no control. Whilst cast iron is cooling from highly-superheated temperatures to that of solidification, reactions occur between included or dissolved iron oxide and the carbon in solution. Furthermore, it is highly probable that reactions occur between the constituents, including iron oxide and the liberated carbon monoxide, as a result of which particles of manganous oxide and silica are liberated, which will, in turn, unite to form a manganous-silicate slag. That this is probable is borne out by the fact that buttons of slag, composed of a silicate of manganese, have been found at the bottom of pipe cavities in large steel ingots, and it is to be expected that similar inclusions will be frequent in cast iron, especially if the metal is overblown and oxidised. It cannot be doubted that iron oxide is often produced in cupola melting, and the control of the cupola should be rigorous to ensure the elimination of this source of trouble as far as is practicable.

FIG. 19.—EXPANSION SHOWN ON RISER.

Metal Faults

Compared with defects which may be attributed to moulding practice, the number of defects directly attributable to metal are relatively few. Nevertheless, by virtue of the complex nature of the material which the iron-founder has to handle, the troubles associated with his metal make up in quality the bugbears which it lacks in quantity, and the mastering of these is by no means an easy matter.

Cold shuts are one of the obvious metal faults, and in properly-controlled work should be of very infrequent occurrence. If metal of proper temperature be supplied to the moulder and due consideration be given to the sizes of gates and their position to ensure the easiest and least tortuous filling of the mould no trouble on this account should arise. Damp sand, and cores improperly vented so that the metal does not lie quietly, also produce cold shuts, but in the majority of cases the defect arises from attempting to cast too many moulds from the one ladle of metal rather than return some metal or pour it on the floor, with the result that metal which has cooled below its useful lively state is used.

Gas-holes are often confused with blow-holes, but should be recognised as an entirely different trouble. These are usually brought to light when a top surface is machined, and in every case are caused by pouring with metal which is too "stiff." It is now fairly well recognised that iron oxide is produced in cupola-melted iron. This oxide reacts with the carbon in the iron to give carbon monoxide, and the now gassy and more viscous metal rapidly loses its "life." On pouring, the gases in the metal and entrapped mould gases may rise to the surface or top of the mould but become trapped there under the rapidly-formed skin of the casting, giving rise to gas-holes which are only revealed under the surface when machining takes place. Had the metal been sufficiently hot, such gases would have risen to the top and escaped through the mould before freezing commenced and a solid crust been formed. Hematite and so-called semi-steel mixtures are very prone to give this trouble if not cast hot, and in green-sand work the use of sand which is on the damp side aggravates it also.

Drawn, spongy or porous castings are nearly always due to solidification troubles. A drawn hole as usually visualised is really an enlarged porous spot and is due to solidification taking place at different times in different parts of the casting. Porosity in general is a result of improper gating or feeding and is aggravated by dull metal. If the metal is dull and the runner sets before the casting has had time to feed, not only will a shrinkage hole appear, but general porosity is highly probable. The early closing of the runner and consequent formation of a void below, by virtue of the shrinkage, results in the removal of the ferrostatic pressure at that point, and the iron just below will relieve itself of surplus gas held in solution. Moldenke has explained this very nicely when he likens the conditions to a bottle of soda-water which, upon removing the stopper, exhibits a series of bubbles at the top due to surplus gas being evolved through released pressure whilst the lower portion of the liquid retains its gas and quiescence. The bubbles in the iron may be too small to be seen, but they are there nevertheless and give rise to porosity.

FIG. 20.—SECTION THROUGH FIG. 19.

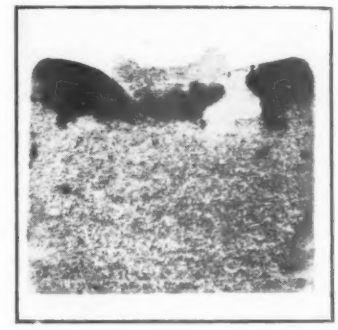

FIG. 21.—SULPHUR PRINT THROUGH FIG. 19.

Smalley has recorded his observation* to the effect that "Cupola-melted grey cast iron of normal chemical composition does not shrink on solidification if poured with a sufficient degree of superheat and if cooled faster than a certain critical rate."

It has also been established that the more rapid the cooling, the less the liquid shrinkage of grey cast iron, and within certain limits of cooling hard iron and soft iron exhibit little or no volume change on solidification provided both are grey. This implies that there exists for each class of grey iron a minimum rate of cooling above which the metal will not shrink on solidification when poured at a suitable temperature, and a soft grey iron cooled more slowly than this minimum rate will shrink just as readily as a harder iron.

It is not possible, however, in practice to maintain the critical conditions necessary to ensure solidification without shrinkage, as above outlined, and it becomes necessary to adopt such measures as will counteract the effect of the

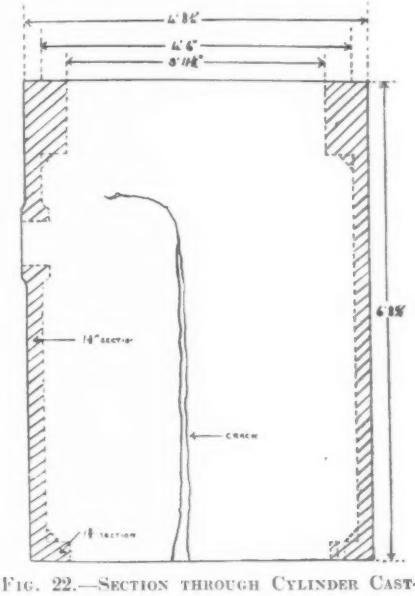

FIG. 22.—SECTION THROUGH CYLINDER CASTING WHICH CRACKED DURING STRIPPING.

* Proc. I.B.F. Vol. XVI, p. 437.

divergencies from the ideal conditions. In is unnecessary to detail the methods used for this purpose; suffice to say that attention to position and size of runners and risers, hand feeding, etc., and the use of denseners at heavy sections are usually sufficient to overcome the trouble, in conjunction with metal suited to the work on hand. In extreme cases it has been found that the addition of nickel in small amounts has proved successful in overcoming shrinkage where other methods failed.

TABLE II.

Shrinkage Tests on Scrap from Cracked Stand-post, Remelted in Crucible. Dry-Sand Moulds using 1 in. sq. Bars.

Chemical analyses.						Casting temperature.	Linear shrinkage per ft.	Remarks.
T.C.	C.C.	Si.	S.	P.	Mn.	In deg.C.	In in.	
3.99	0.91	0.84	0.026	0.18	1.18	1,200	0.120	Scrap without additions.
3.48	0.90	1.54	0.070	0.16	1.13	1,140	0.082	Scrap with ferro-silicon added.
3.59	0.73	1.85	0.039	0.16	1.20	1,200	0.1185	" " " "

Shrinkage Tests on Cupola Melted Grey Cast Iron. Dry-Sand Moulds using 1 in. sq. Bars.

Chemical analyses.						Casting temperature.	Linear shrinkage per ft.	Remarks.
T.C.	C.C.	Si.	S.	P.	Mn.	In deg.C.	In in.	
3.39	0.42	2.48	0.124	0.35	0.98	1,200	0.088	No. 1 Cupola Iron.
3.55	0.53	2.39	0.103	0.29	1.10	1,200	0.126	No. 1 Cupola Iron.
3.63	0.72	1.97	0.113	0.29	0.96	1,200	0.122	No. 2 Cupola Iron.
3.36	0.90	1.57	0.039	0.23	1.80	1,200	0.1185	No. 3 Cupola Iron.
3.47	0.88	1.36	0.088	0.18	1.25	1,200	0.122	No. 3 Cupola Iron.

Shrinkage Values Found by Various Observers. 1 in. sq. Bars.

Chemical analyses.						Casting temperatures	Linear shrinkage per ft.	Authority.
T.C.	C.C.	Si.	S.	P.	Mn.	In deg.C.	In in.	
3.45	0.35	2.75	0.09	1.45	0.95	1,350	0.152	I.B.F. Cast Iron Sub-Committee.
3.60	0.45	2.15	0.08	0.05	0.75	1,350	0.140	" " " "
3.30	0.62	2.03	0.11	0.79	0.72	1,400	0.152	" " " "
3.30	0.62	2.03	0.11	0.79	0.72	1,350	0.154	" " " "
3.30	0.62	2.03	0.11	0.79	0.72	1,325	0.154	" " " "
—	—	2.23	—	—	—	—	0.124	Keep.
—	—	2.01	—	—	—	—	0.143	"
—	—	1.21	—	—	—	—	0.150	"
—	—	1.17	—	—	—	—	0.145	"
3.52	0.79	1.41	0.07	0.96	0.43	—	0.133	Turner.

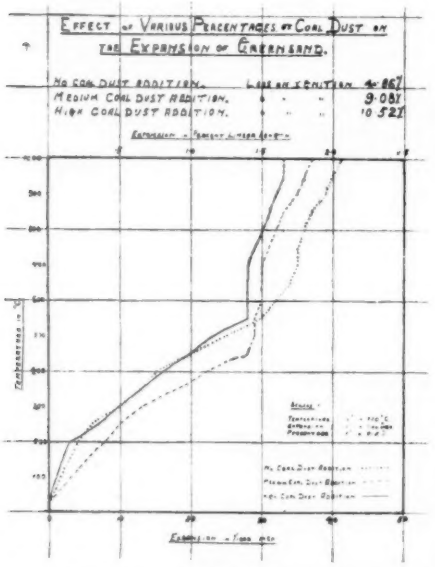
EFFECT OF VARIOUS PERCENTAGES OF COAL DUST ON THE EXPANSION OF GREEN SAND.
NO COAL DUST ADDITION.
MEDIUM COAL DUST ADDITION.
HIGH COAL DUST ADDITION.

FIG. 23.—EFFECT OF COAL-DUST ADDITIONS ON EXPANSION OF ORDINARY GREEN SAND.

While dealing with shrinkage, an interesting feature observed recently is worth recording. In the case of oxidised metal, the occluded gases and dissolved oxide of iron tending to make them, may be sufficient not only to prevent shrinkage on the part of the iron, but actually to cause it to expand. In this way has arisen the peculiar feature observed on a riser, and illustrated in Figs. 19 to 21. It will be seen from the shape of the riser that a slight shrinkage has taken place initially, but this has been rapidly overcome by an expansion which actually forced metal out of the riser. The sulphur print shown in Fig. 21 affords indication that the casting temperature has been sufficiently high, and the only assumption that can be made is as explained above, to the effect that the liberated gases have expanded in the metal and forced the still molten residue up the riser.

Total Shrinkage

Contraction or *total shrinkage* is another subject upon which much has been written during the past few years, but in the majority of cases the results are so obscured by masses of data that the average foundryman is largely in the dark as to what conclusions may be drawn from them. In this connection, it will be interesting, and probably profitable, to examine an actual case of fracture through contraction for which no allowance was made, but it should be realised that the remarks apply in this case to castings of a heavy nature. Fig. 22 gives a sectional view of the casting in question, which cracked whilst being stripped from the mould some 19 hrs. after casting. The job was made in loam with a loam core, and it was not considered necessary to effect any slackening. The fracture was typical of grey cast iron with a slightly open grain, and the metal on analysis showed:—Total carbon, 3.98 per cent.; graphitic carbon, 3.00; combined carbon, 0.98; silicon, 1.43; manganese, 1.17; sulphur, 0.06; and phosphorus, 0.15 per cent.

The Brinell-hardness number of the 1½-in. section was 179. It was contended that the fracture was entirely due to an excessively-high contraction in the metal, but such is not to be expected from an iron of the quality shown. Shrinkage test-bars 1 in. sq. were cast in dry-sand moulds to duplicate practical conditions as far as possible using the scrap from the broken-up casting remelted in a crucible. At the same time, comparative tests of the various grades of iron in use in the works were cast and the shrinkage values obtained are set out in Table II along with values obtained by various other observers. It will be seen that in the case under review the linear shrinkage is below the accepted figure of ⅛ in. per ft. and much below the values recorded for similar irons by other observers. A survey of the Tables shows further that within the limits of composition specified for general engineering castings, the linear shrinkage is not effected by composition to any appreciable extent provided the silicon does not rise above 2.5 per cent. and the fracture of the iron remains grey. This shows that the metallurgist has little control over the metal contraction within these limits.

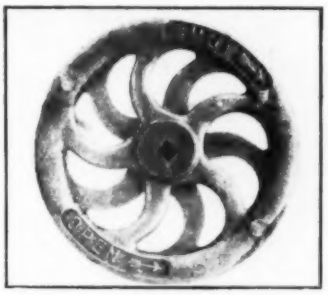

FIG. 24.—CURIOUS DEFECT DUE TO FAULTY BOX-PART REGISTRATION.

The only other factors associated with the metal and having a bearing upon the defect are the strength and stretching capacity of iron at elevated temperatures. It is not generally appreciated that down to 500 deg. Fah. (260 deg. C.) all grey cast iron is capable of stretching. Smalley has also investigated these factors* and shown that the higher the silicon the greater is the extensibility hot, or, in other words, the softer the iron the more readily will any casting accommodate itself to stresses caused by the effect of constriction and restricting cores, etc. In Table III the strength figures for grey cast iron at elevated temperatures are given, and it will be further noticed that the softer high-silicon and high-phosphorus irons are much weaker at high temperatures than irons of lower silicon and phosphorus contents.

TABLE III.—*Tensile Strength of Grey Cast Iron at Elevated Temperatures.*

Chemical Analyses.						Tensile strength in tons per sq. in. at deg. F.					
T.C.	C.C.	Si.	S.	P.	Mn.	1,400	1,200	1,000	800	500	Room temperature.
3.65	0.15	2.92	0.062	1.26	0.49	1.75	4.96	10.00	11.00	9.90	12.00
3.08	0.60	2.00	0.089	0.096	0.57	3.80	6.90	13.50	18.20	16.30	17.80
3.31	0.60	1.50	0.112	0.49	0.74	4.00	7.00	14.00	17.00	16.20	17.75

These results throw considerable light on the question of cracked castings and indicate the position which the foundryman or metallurgist must take up when preparing his charge for any particular type of casting. All grey irons are extensible when hot to some extent, and therefore capable of accommodating themselves to stresses set up by constricting cores, etc., but irons of sufficiently-high stretching capacity are of such a composition as to preclude their use for large castings on the grounds that satisfac-

* Proc. I.B.F., Vol. XV, p. 702.

tory castings could not be made from them. It is therefore obvious that cracking of large castings of the composition demanded by modern practice can only be avoided by (1) releasing or removing restricting cores, etc., while the casting is at a dull red heat (650 deg. C.); (2) by retarding the rate of cooling during the "blue-brittle" range of temperature (approximately 500 to 600 deg. C.) to a rate of approximately 10 deg. C. per hr., and (3) by accelerating the cooling of heavier sections or retarding the cooling of lighter sections in order to obtain uniform cooling as a whole.

It may also be of interest to point out that an investigation of the expansion of moulding materials, sand and loam, etc., has shown that these expand by amounts up to and over 0.2 in. per ft. on heating to 1,000 deg. C., a figure which is in excess of the shrinkage values found for grey iron, and hence in a mould there exists two forces directly opposing one another and tending to pull the casting apart. Experiments appear to indicate that sand mixtures may be obtained in which the expansion of refractory is reduced to a minimum as is illustrated in Fig. 23, which shows the effect of coal-dust additions to ordinary green sand in so far as refractory expansion is concerned; but in view of the incompleteness of existing knowledge of the subject at the present stage, and also the lack of knowledge on the strength of sand or loam in mould or core formation at elevated temperatures, the safer plan, if wasters are to be avoided, is to remove all restricting cores, etc., rather than rely on such restrictions collapsing under the pressure of the shrinking casting.

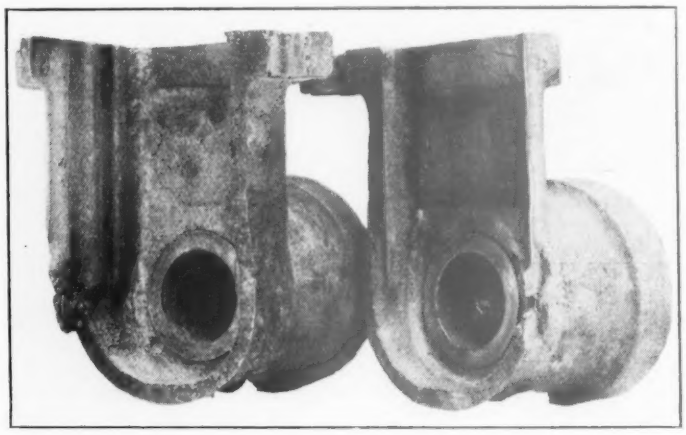

FIG. 25.—DEFECT DUE TO INTERRUPTED POURING.

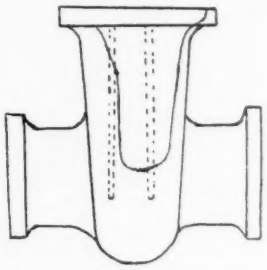

FIG. 26.—NATURE OF DEFECT SHOWN IN FIG. 25.

Bad Work

The term "bad work" has been used for lack of a better designation, and is intended to cover such types of defect as may easily be avoided by reasonable care on the part of the moulder. Under this category may be considered the closing of moulds wrongly, omission of small cores, short pours, interrupted pours and breakages due to the opening of moulds or removing of runners and risers before the casting is properly set. Fig. 24 is an illustration of one of these types, and presents an amusing appearance. It is confessed that, when first shown the hand-wheel, the author was struck by its appearance and imagined it to be a new design. Closer examination, however, revealed the casting as a defective one, arising from incorrect registering of the cope and drag.

Fig. 25 shows a valve which burst under test, and an inspection of the casting reveals a defect resembling a cold shut extending from the top flange down the corner of the valve body to a point in line with the waterway and on the side of the valve cast upwards. On breaking the valve body further, it was discovered that the corresponding side of the casting exhibited the same cold shut appearance, extending from the square flange to the ring seat, as shown in Fig. 26. It was evident, then, that the defect was not a cold shut. The valve being cast from the top, failure has arisen through an interrupted pour, either a run-out or a shortage of metal followed by the addition of more metal, which has failed to weld solidly with the metal already in the mould and which was probably set. The remedy in such cases is, of course, perfectly obvious.

As a final example of how defects arise, Fig. 27 illustrates a casting which has been sacrificed to time. Obviously, the moulder or his boy has been too anxious to get the runner and riser broken, with the result that the flange of the casting has been cracked and twisted out of shape while still in a plastic state. Defects of this type are happily not so frequent, but should never occur.

FIG. 27.—DEFECT DUE TO BREAKING OFF A RUNNER TOO EARLY.

The successful elimination of defective castings is not a matter which either foundry artisan or metallurgist alone can accomplish, but requires rather the close co-operation of both. In the foundry, rigid supervision is essential in these days of mass production to eliminate as far as possible the elements of uncertainty introduced by man's human failings, and on the part of the technical staff as rigorous control is required to ensure uniformity in the raw materials supplied to the practical man. Where such is the practice, successful results can be looked for and, indeed, accrue, as shown in Table IV, where the percentage defectives arranged in accordance with the classification used throughout this Paper and calculated on the total castings produced in the light-castings foundry of the author's employ, are recorded for the years 1932-33. It will be seen that there is a decided reduction in all but two cases, which are capable of explanation. The increase in slag holes is due to the fact that hotter metal is in use now than ever before, and for a time it was not realised that this was giving rise to increased slag through the fusion of the refractory used for lining the ladles. The very slight increase in defects under bad work is undoubtedly due to to increased production of green-sand castings, formerly made in dry sand. The results on the whole amply justify the control exercised.

TABLE IV.—*Analyses of Defective Castings.*

Classification.	Percentage on total castings.	
	1932–33.	1933–34.
Mould and core faults ..	0.801	0.684
Sided	0.154	0.119
Blow-holes	0.269	0.251
Sand holes	0.770	0.365
Slag holes	0.224	0.315
Metal faults	0.207	0.129
Bad work	0.323	0.329

In conclusion, the author wishes to convey his indebtedness to Mr. Gardner, works manager, and the directors of Messrs. Glenfield & Kennedy, Limited, for permission to use the data accumulated as a result of the numerous investigations carried out; also to Mr. Hudson, chief chemist, for his collaboration in carrying through the work and his assistance in compiling the present Paper.

Glass Silk

At a joint meeting of the Glasgow section of the Institute of Chemistry and the Society of Chemical Industry, on January 18, Mr. J. Boyd, of Messrs. Chance Brothers & Company, Limited, read a Paper on glass silk, and Dr. Hampton, of the same firm, read a Paper on the properties of glass. Mr. Boyd, in the course of his Paper, said that the problem of heat insulation had received much attention in recent times, and its importance was being appreciated to an increasing extent. Until quite recently the choice of materials for heat insulation was more or less limited to cork, mud clay and mixtures of these with straw or similar material. But with the use of higher steam temperatures and increased superheat there was a great demand for a material which could withstand higher temperatures. The use of spun silk originated in Germany during the war, and four years ago Messrs. Chance Brothers commenced its manufacture in Glasgow. In spite of adverse conditions the venture had proved successful, and the use of glass silk as an insulating material had made steady progress. It could definitely be stated that a new industry had thus been established in Glasgow producing material capable of meeting the most stringent requirements of modern engineering. Dr. Hampton, in the course of his Paper, dealt with the physical properties of glass, and explained that the tensile strength was not constant in a large bulk of solid glass. It had been demonstrated that the tensile strength of fine threads of glass was much higher than glass in large sizes, and the finer the thread the greater the strength. A mattress made of glass silk had a much higher tensile strength than a block of solid glass of the same thickness, and any variation in the tensile strength of the individual threads was negligible owing to the large number of threads present.

Radiator and Boiler Foundry Installs New Sand Preparing Plant

The name of the Beeston Boiler Company, Limited, is, of course, well known as manufacturers of the world-famous Robin Hood boilers and Beeston radiators. In order to keep pace with increasing demands and with the desire still further to improve their product, this foundry recently installed a new facing-sand plant, several illustrations of which are here reproduced.

Fig. 1 shows the screen on to which the sand is shovelled. This screen is of the roto-vibratory type, having a swirling in addition to vertical-vibrating motion. Drive is effected from a direct-coupled 1-h.p. motor. Sand falling through the screen is collected on a belt conveyor, and the waste is discharged on the front end of the screen.

Fig. 2 is a view of the back end of the screen, showing collecting-belt conveyor. The mild-steel end-plate has an adjustable bottom plate to regulate the sand thickness on the belt. The pulley, shown in the photograph, is a magnetic separator, which removes the small pieces of flash and pump iron not taken out during the screening operation. The sand is delivered by the belt conveyor into the bucket of the mill loader. The bucket has small extension pieces inside to indicate the weights at different levels, and these are, of course, used to measure the requisite quantities of old and new sand. The complete batch weighs 6 cwts. The water addition is made in the mill, not in the loader, and is sprayed on the sand from a pipe running around the mill sides. The amount of water is definitely fixed, and is controlled by a meter.

Fig. 3 shows the relative position of the screen, bucket loader and mill. The mill unit is of the latest design, ball-bearing type, equipped with one runner and one set of stirrers instead of only two runners. The stirrers being positively revolved in their travel around the pan, provide a constant agitating action on the sand, which never becomes close or lies in cakes. It is claimed for this combined mixing and milling feature of the runner and stirrers that it gives better bond and permeability, and accordingly reduces the amount of new sand required. The mechanical construction of the mill permits of adjustment, giving complete adaptability for the different grades of sand, which require variation between the mixing and milling actions. As shown in the illustrations of this particular installation, the mill is direct driven from a 10-h.p. totally-enclosed slip-ring motor.

Fig. 4 is a general view of the plant. It will be seen that, when the sand is discharged from the mill, it is elevated and delivered to a "Silkysand" disintegrator placed directly over the storage hopper. The hopper is equipped with chop gates controlling the flow of sand into the barrows. The capacity of the hopper is 3 to 4 tons. It is arranged that for every load of facing collected, a load of black sand is returned to the plant, and all barrows are strickled level to prevent spillage.

The "Silkysand" disintegrator is a direct-

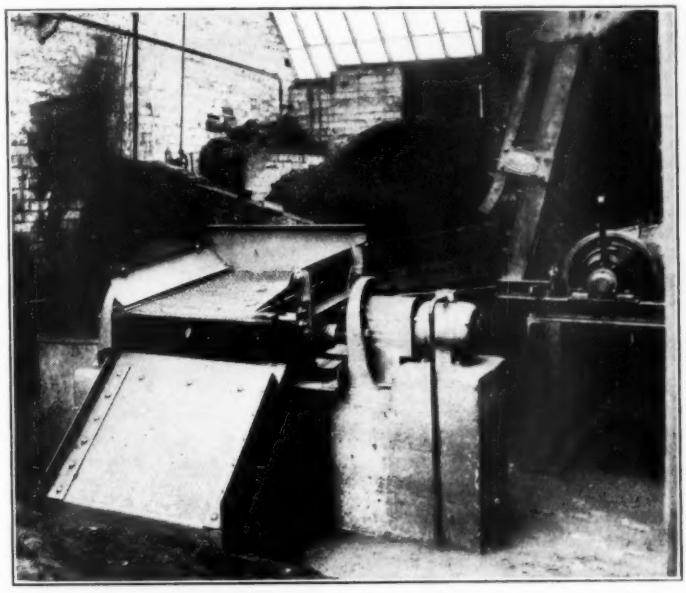

FIG. 1.—SHOWS ROTO-VIBRATING SCREEN WHICH RECEIVES SAND TO BE PREPARED.

FIG. 2.—THE SCREEN SAND PASSES THE MAGNETIC PULLEY AND IS DELIVERED TO BUCKET FOR LOADING INTO THE MIXER.

FIG. 3.—SHOWS THE SCREEN, THE MAGNETIC PULLEY BELT, AND THE BUCKET-LOADED MILL.

coupled machine on which there are no belts or gears. The motor is 3 h.p. and is placed overhead. The hood enclosing the disintegrating pins is made split with both halves hinged, giving complete accessibility. It is claimed for this design of machine that it is impossible for scrap to cause damage, although in this particular installation all scrap has, of course, been removed either by the screen or magnetic separator.

This facing-sand plant was designed and built by Pneulec, Limited, Smethwick, near Birmingham. All backing sand in the Beeston Foundry is conditioned with 14 Pneulec Royer machines of the No. 1 and No. 2 size, thereby making a complete combination.

FIG. 4.—CARRIES THE SEQUENCE OF OPERATIONS FURTHER TO INCLUDE THE ELEVATOR TO FEED THE DISINTEGRATOR SERVING THE STORAGE HOPPER.

Publication Received

Aluminium Facts and Figures. Published by the British Aluminium Company, Limited, of Adelaide House, King William Street, London, E.C.4.

This well-known and much-appreciated publication has taken on a new form. It is now much larger and more comprehensive. It is a model of handiness, as not only has it full contents lists, and an excellent index, but in addition the edges are thumb-nail cut to form an auxiliary index. The book, which contains 166 well-illustrated pages, is divided into two main sections, the first of which deals with "forms and sizes" and the second with working and finishing. Thus, the book states very clearly what is available by way of material and data and how to make the best use of this knowledge. Foundry executives will find in this book a complete list of the B.S. specifications, the properties of the better-known alloys, reliable information on annealing, heat-treatment, mixing, melting and casting, welding, soldering, polishing, cleaning, anodising (or colouring) and painting. We presume that this book is available to responsible members of the industry on application to the publishers. We state without hesitation that we have often reviewed books costing one pound or more which were much less useful as a text or reference book than this particular publication.

AS THE RESULT of somewhat prolonged negotiations, a large block of factory premises formerly occupied by Messrs. Campbell, Achnach & Company, Limited, in Wallace Street, Glasgow, have been sold to a Birmingham firm for the purpose of manufacturing hardware.

The Roll Foundry of C. Akrill & Company, Limited

(*Concluded from page 76.*)

they are subject to a special treatment which gives a much lower carbon content at the base of the pass than obtains at the sides. Fig. 5 (D) shows a set of part-chilled rolls for rolling sheet bars. The special feature of these rolls is that, in addition to the finishing passes being chilled, the close holes alongside are also chilled.

Fig. 5 (C) illustrates a roll which was made for research purposes. It is known as the modified Ni-hard, and rolls of this type are made under special licence from the Mond Nickel Company, Limited, of London. The roll has been cut down, the diameters from the largest to the smallest being as follows (diameter and shore hardness):—13⅜ in. (69), 12¼ in. (67), 10⅞ in. (64), 9⅝ in. (62), 8¾ in. (56) and 7⅛ in. (50). The gradual and consistent step-by-step fall in the hardness from the largest to the smallest diameter is certainly remarkably good. Fig. 5 (B) shows a pair of patent-process alloy grain rolls for rolling piling sections.

Walking through the works and glancing at the old foundry, now regarded as a small, rough stores, one can understand the ingenuity of the old founders, who were not only able to cast but also to handle the heavy rolls they undoubtedly produced with little other than that of horse-power. A straight run through from the raw material to the finished product is, of course, desirable in every factory, but where exceptionally-heavy weights have to be handled, as in the foundry under notice, it becomes a factor of vital importance, and in this respect the arrangement at the Gold's Green Foundry approaches very nearly to the ideal.

The foundry, the fettling shop and the machine shop are in line and are housed in a building 400 ft. long by 63 ft. wide, the gantries carrying a 40-ton, a 30-ton and a 10-ton crane. The furnaces are arranged in parallel, and beyond these last is the stocking ground, which is spanned by a gantry, 30 ft. wide with a total length of 440 ft., and is travelled by a 7-ton crane. At the side of the stocking ground are the fuel stores. A high-grade fuel is used (washed beans), a typical analysis being moisture, 10.0 per cent. to 15 per cent.; volatile, 37 per cent. to 40 per cent.; ash, 3.5 per cent. to 5 per cent., sulphur, 0.9 per cent. to 1.0 per cent. Calorific value, 13,000 to 13,400 B.T.U. Buildings have been erected which provide storage for 1,000 tons of coal, the bin system being employed; the fuel is thus air dried before being fed to the pulverisers. The 15-ton Avery weighbridge, by which the stocking ground is served, is installed beneath the extension of the gantry, so that the floor in the neighbourhood of the furnaces is free from obstruction.

Melting Equipment

There are five furnaces, one 15-ton, two 10-ton, one 7-ton and one 2-ton capacity. As previously stated, the whole of the furnaces are fired with pulverised fuel; the primary installation was in connection with the 7-ton furnace, a Clarke Chapman Resolutor plant being put down in 1927, and this unit is still in service. A second furnace is similarly equipped and the remaining three furnaces are served by Attritor units, supplied by Alfred Herbert, Limited.

Moulding and casting is carried out at the north end of the building; this, however, does not call for any detailed description. There are seven stoves all served by girder bogies which travel on rollers. Two of the stoves have recently been converted to the Herrmann system with which very accurate control can be obtained over the temperature. A thermo-couple enables a complete record to be kept of the complete cycle of operations. The remaining stoves are, for the time being, coal-fired.

In the machine shop there is a very complete range of up-to-date roll lathes and grinding machines, amongst which mention may be made of two Waldrich roll lathes which will take all sizes of rolls and a Waldrich grinding machine upon which rolls up to 46½ in. in dia. can be finished. Immediately beyond the machine shop is the packing and despatch department.

Power is taken from the West Bromwich Corporation at 6,600 volts a.c. and 460 volts d.c.; formerly the a.c. current was dealt with by three converters, these, however, are now acting as standby to a transformer, and the latest type mercury-arc rectifiers which were installed by the Mechanical & Electrical Engineering Company, of Walsall. This, we believe, is the first of such installations in the Midlands, and is giving a very satisfactory performance.

There is a well-equipped laboratory and micro room. All raw materials are analysed before being passed to stock and exceptionally large stocks are carried of the best grades of hot- and cold-blast irons of different grades, so that the most stringent specifications can be met. The laboratory staff are also responsible for complete records of all rolls as they pass through the various stages of manufacture. Records are also kept of the behaviour of special rolls under actual working conditions and such records for the basis of research which is constantly in progress.

Selecting Foundry Conveying Equipment

(*Concluded from page 74.*)

of the purchaser and his organisation to make this thorough survey, is a good investment, as he will know exactly what he is going to receive for his money, and thus eliminate dissatisfaction when the system has been installed. This feature also goes a long way in obtaining co-ordination of the operations in and surrounding a new conveying system in the shortest possible time. The same care exercised in the selection of the continuous grey-iron moulding system described, should be used in the selection of systems for foundries pouring malleable iron, steel and non-ferrous metals. Each of these foundries has its own problems and, therefore, requires individual study to determine the best lay-out and selection of units for good investment.

A NEW COMPANY, to be known as Irish Enamelware, Limited, has been registered in the Free State, with a capital of £20,000 in 10,000 ordinary and 10,000 preference shares, all of £1 each, to carry on business as enamellers, galvanisers, etc. The first directors are Messrs. J. P. Eveson, G. H. Eveson, M. Dalton and E. Holliday. The headquarters will be in Dublin.

The Institute of British Foundrymen

WEST YORKSHIRE BRANCH DINNER

The annual dinner of the West Riding of Yorkshire Branch of the Institute of British Foundrymen took place on January 12, at the Great Northern Victoria Hotel, Bradford. The function was an extension of previous dinner gatherings in that it was followed by a dance as well as by a short toast list.

Mr. A. W. Walker, of Huddersfield (Branch-President), presided over a large gathering. A particularly interesting feature of the occasion was the presence of the President (Mr. Roy Stubbs) and members of the General Council of the Institute.

Proposing a toast to the visitors—which included the President and Council of the Institute—MR. WALKER, the Branch-President, said the day had been a momentous one in the history of the West Riding Branch, it being the first occasion on which they had had the privilege and honour of entertaining the General Council of the Institute in their midst. The occasion gave them cause to look to the possibility of the day when the annual Convention of the Institute might be held in their district.

The LORD MAYOR OF BRADFORD (Councillor W. Hodgson) said that it was a pleasure to express appreciation of the General Council of so important an organisation having chosen to meet in that city. Bradford might not be so important in engineering circles as some other great centres represented there that evening, but Bradford had world-wide fame in the wool-textile industry, and the ramifications of that industry were responsible for quite a good deal of foundry work in the district. The Lord Mayor said that he had been very interested to hear the chairman express a hope that the day might come when the Convention of the Institute would meet in that district, and if they were ever so honoured, the visitors could be assured of a friendly welcome.

MR. ROY STUBBS, President of the Institute, responding to the toast and voicing thanks for the Lord Mayor's welcome, said that the members of the General Council, he was sure, warmly appreciated the hospitality of the West Riding Branch and the cordiality of the Bradford welcome. He hoped that the meeting that day would help to stimulate activity in the area and increase the membership of the Branch. He also hoped, like Mr. Walker and the Lord Mayor, that the day was not far distant when the West Riding would have the privilege of receiving the Conference of the Institute. Mr. Wise, as they all knew, was a man who believed in getting ready for things in good time, and, in the hope that the visit of the Conference might not be anything like the length of time away which it had taken the General Council to come to Bradford, he thought Mr. Wise had better be getting busy right away.

Responsibility of Branch Councils

MR. T. MAKEMSON, secretary of the Institute, giving the toast of the West Riding Branch, said that it was not his own first visit to that area, and it was a special pleasure to propose the toast because nobody, perhaps, knew so well as himself how much the success of the Institute depended on the branches and how dependable a branch was that of West Yorkshire. There were some national organisations in which the branches were very much subjected to central control. In the Institute of British Foundrymen the branches had much greater control of their own affairs, and also of the national affairs of the Institute. That wide measure of control, of course, carried with it responsibilities, and it was gratifying to know that as a general rule that responsibility was shouldered seriously and not abused. The West Riding Branch carried on its work in a quiet but very dignified and effective manner. It was a branch well conscious of its responsibilities beyond its own area affairs. Several of its officers and members were most valuable workers in the national sphere, rendering important service on national committees and on the Council. The West Riding (continued the speaker) had a successful branch because it had enthusiastic and capable officers, backed by a loyal membership. It had, if he might be pardoned for using an engineering phrase, an enthusiastic and efficient generator in Mr. Wise, the Branch secretary, a great leader and an inspiration for the ideals of the Branch and the Institute. In Mr. Wise the Branch had a most successful secretary.

MR. S. W. WISE, hon. secretary of the Branch, in responding to the toast, said he was grateful to Mr. Makemson for the warm tributes he had paid to the West Riding Branch, but somewhat abashed by the kind things that had been said about himself.

Book Review

Giesserei Taschenbuch. 1935. (Foundry Pocket Book.) Published by Verlag Otto Elsner G.m.b.H., Oranienstr. 140, Berlin, S.42.

This handbook, issued by the publishers of the German periodical "Foundry Practice," has several interesting features. In a foreword, reference is made to the pride with which German industry can view the economic progress made since the advent of the Hitler *régime*. It is pointed out that there is a shortage of raw material and the present handbook has been drawn up with a view to helping the improvement of quality and production in spite of this shortage. The first portion of this book consists of a diary, seven days to the page with, unfortunately, the first twenty weeks omitted in the copy sent for review, a series of tables of powers, roots, reciprocals, etc., some useful bulk densities of foundry raw materials, and other foundry data, including analyses of German pig-irons and typical compositions for various castings. The main section consists of a series of technical articles dealing with iron, steel and non-ferrous foundry practice, presumably reprinted from the technical periodical mentioned above. The subjects cover cast *v.* welded parts, properties and application of various core binders, rammed linings and cupola-patching materials, practical experience in the use of denseners and chill cores, the use of the low-frequency induction receiver with the cupola, the manufacture of aluminium sand and die castings, high-pressure bronzes, malleable-melting and annealing furnaces, strength of malleable cast iron, equipping a malleable foundry for large-scale output, green-sand steel castings. The articles are essentially practical in character and in many cases cover personal experiences of the individual writers.

The subject matter does not cover every phase of foundry practice and the book is not therefore similar to the technical handbook usually met with in this country. However, the technical Papers give a useful collection of foundry data and methods.

A list is given at the end of the book of the Reichs industrial group of the Deutsche Arbeits Front, sub-group 1/3b, "foundry foremen," with regional groupings and local meeting places, times, chairmen and secretaries' addresses.

F. K. N.

THE ADMIRALTY has placed an order with the Rose Street Foundry & Engineering Company, Limited, Inverness, for the construction of two harbour launches, each 52½ ft. long. The firm have also an order from the Admiralty for an extensive repair to a battle-fleet practice target from Invergordon.

The Lead Situation

By "ONLOOKER."

The most interesting recent development in the lead situation is the fact that as the result of an approach to the Board of Trade on the grounds of an unsatisfactory state of affairs in this country, the Import Duties Advisory Committee has been asked to set on foot an inquiry into the points at issue, not only in lead but also in spelter. Briefly, the situation from the consumers' side is that supplies of duty-free metal are inadequate and unreasonably dear in comparison with the L.M.E. price, while the producers complain that the official daily quotation does not truly represent the world value of the metal.

Consumption of lead in this country during 1934 has been estimated at 320,000 tons, and this figure is probably not far out, for the building trade has been very active and there has been a distinct improvement in the volume of business in batteries and cablemaking. To cover these needs very large quantities of lead have been imported from Empire sources, and, in addition, users have been obliged to draw upon foreign metal lodged in bonded warehouses, these parcels, of course, only being obtained on payment of the duty. In view of the general assurance given at Ottawa that consumers in Britain would be adequately supplied under the preference granted to the Empire producers, very great dissatisfaction is felt among manufacturers at the way in which matters have fallen out. There can be little doubt that the decision to tax imports of such important raw materials as lead and spelter was a mistake, but once imposed, it is not easy to obtain remission of these duties when made under trading agreements with other countries.

The decision to hold an inquiry into the lead and spelter position has been hailed with relief by all concerned, for the situation had become extremely difficult, and for that matter still is, for scarcity of supplies is still as acute as ever and users are obliged to pay stiff premiums over the L.M.E. quotation. On the other hand, the producers maintain, and there is a good deal to be said on their side, that a basis of £10 per ton for their product is poor. It certainly seems a very low price at a time when consumption in Britain is at the rate of more than 25,000 tons per month, but the trouble is that practically every ton of this business is being done *off* the Metal Exchange, for practically all the lead on warrant is foreign and therefore dutiable, the duty in accordance with L.M.E. regulations being for account of the buyer, who naturally fights shy of deals of this kind.

Pending a decision by the Board of Trade following on the I.D.A. Committee's report, business in lead is rather quiet, for opinion is divided as to the effect on the price. This must obviously depend upon the findings of the commission and the extent to which their recommendations can be put into practice. In some quarters it is argued that the duty will be abolished; but this is going to be very difficult in view of the issues involved, and some less drastic remedy seems to be more likely. The producers say that sales of foreign lead, which is eventually shipped into bond in this country, are responsible for price depression and probably they are right. Why not then stop the practice of putting lead into bond, or at any rate severely curtail the period of free storage which has, as a matter of fact, just been extended from 3 to 5 years? At the same time, it might be considered advisable to release from bond some thousands of tons to relieve the present scarcity of supplies, for there appears to be little sense in leaving this tonnage idle, incurring rent all the time.

XUM

This Week's News in Brief

Trade Talk

HIGH PRODUCTION DIE CASTINGS, LIMITED, is being wound up voluntarily.

MESSRS. JAMES MITCHELL & SON, a well-known Kincardineshire firm of tinsmiths and plumbers, celebrates its centenary this year.

THE ADMIRALTY has decided to entrust the construction of the mine-laying submarine of the 1934 programme, H.M.S. "Rorqual," to Messrs. Vickers-Armstrongs, Limited, Barrow-in-Furness.

MESSRS. STEWARTS AND LLOYDS, LIMITED, have received an order for 75 steel lamp columns for the Beckenham Urban District Council. The order is for 63 columns of the non-ventilating type and 12 of the ventilating type.

AT A MEETING of holders of debenture stock of Messrs. Hadfields, Limited, at Sheffield, last week, a resolution was carried authorising the reduction of the rate of interest from 5½ per cent. to 4¼ per cent. per annum after August next.

MESSRS. WILLIAM DENNY & BROS., LIMITED, Leven Shipyard, Dumbarton, have received an order from the London & Southend Shipping Company, Limited, for the construction of a twin-screw direct-driven Diesel passenger vessel. The vessel will be about 250 ft. long.

MESSRS. SYKES & HARRISON, LIMITED, have acquired the goodwill and assets of Messrs. Alexander Dunn & Son, an old-established firm of brass and ironfounders, of Piercy Street Foundry, Ancoats, Manchester, 4, to which the whole of their former undertaking is being removed from the Union Street Foundry, Ardwick, Manchester, 12, thereby consolidating the resources of both businesses.

THE GENERAL OFFICES of Foundry Equipment, Limited, 17, Victoria Street, Westminster, London, S.W.1, will be moved to their works, Linslade Works, Leighton Buzzard, Beds., on and after Saturday, January 26. Their London office will be retained at 15, Victoria Street, Westminster, London, S.W.1, but all communications should be addressed to Leighton Buzzard from January 26 onwards.

LAST WEEK a team of 16 representatives of Messrs. Mitchell Russell & Company, Limited, Chattan Foundry, Bonnybridge, accepted an invitation to the Welfare Club of Messrs. Smith & Wellstood, Limited, Bonnybridge, where the rival foundrymen indulged in various games. The Chattan foundrymen emerged victorious by four points. Mr. James Watson presided and congratulated the visitors on their win. The respective works managers, Messrs. Duncan Walker and William Walker, replied.

THE MIDLAND IRON COMPANY, LIMITED, Rotherham, have now made a final payment of 10s. in the £ on account of the profit notes issued three years ago on the reconstruction of the undertaking. It will be recalled that when Messrs. Thos. W. Ward, Limited, Sheffield, took control in 1931 and saved the works from being closed down, they guaranteed payment of interest on the debenture stock, and the redemption out of profits made by the company of profit notes which the creditors received for half the amount of their debts. The first payment of 10s. in the £ was made on June 25, 1934, and this final payment announced by the directors indicates that the upward movement foreshadowed last year has continued, and promises well for the future of the wrought-iron industry and particularly of this old-established Rotherham firm.

MESSRS. WILLIAM DIXON, LIMITED, of Glasgow, were, at a sitting of the Glasgow Dean of Guild Court this week, granted permission to proceed with the erection of a coke-oven plant at their Govan Iron Works in Polmadie Road. This is the first stage in the modernisation of the works for the development of the pig-iron industry, and when the scheme is completed they will be one of the most modern in Britain. The coke-oven installation will consist of 50 coke ovens, with a capacity of 500 tons of coke daily, which is expected to be in operation in about a year's time. Messrs. Simon Carves, Limited, Manchester, have been awarded the contract for ovens of the under-jet compound type with associated equipment for the recovery of by-products. The firm hope to be in a position to manufacture pig-iron at a cost which will enable them to meet the competition of English, Indian and Continental firms. They also hope that eventually the Glasgow Corporation will be persuaded of the economic advantages of utilising the 5,000,000 cub. ft. of surplus gas daily.

A NUMBER OF well-known politicians and steelmakers have accepted invitations to attend the forthcoming dinner of the London Iron and Steel Exchange at Grosvenor House on January 29. In view of the changes which are taking place in the industry, the speeches will have more interest than usual for the trade. Among those who will be present are the Right Hon. J. C. C. Davidson, M.P. (Chancellor of the Duchy of Lancaster), the Right Hon. L. S. Amery, M.P., Sir Andrew Duncan (chairman of the British Iron and Steel Federation), Sir John F. Beale (chairman of Messrs. Guest, Keen & Nettlefolds, Limited), Sir William Firth (chairman of Messrs. Richard Thomas & Company, Limited), Sir William Prescott (chairman of the Metropolitan Water Board), Mr. James Henderson (President of the British Iron and Steel Federation), the Master Cutler (Mr. Alexander Williamson), Mr. Bruce Gardner (Bankers' Industrial Development Company, Limited), Capt. L. D. Whitehead (chairman of the Whitehead Iron & Steel Company, Limited), Mr. A. N. McQuistan (Cargo Fleet Iron Company, Limited), and others. The Right Hon. Lord Greenwood, P.C., chairman of the Management Committee of the Exchange, will preside.

Contracts Open

Slough, January 28.—750 yds. 3-in. and 4-in. cast-iron pipes, for the Urban District Council. The Water Engineer's Offices, Council Offices, Slough.

Wallasey, February 12.—About 150 tons cast-iron class "C" water main; about 250 tons of cast-iron class "A" gas main, for the Gas and Water Department, Gas Works, Wallasey.

Bakewell, February 2.—4,100 yds. of 3-in. dia. iron pipes, with the usual fittings, for the Rural District Council. Messrs. Brady & Partington, Market Street, Chapel-en-le-Frith. (Fee £3, returnable.)

Neyland, February 4.—Eight miles of bitumen-lined steel and cast-iron pipes, from 5-in. to 2-in. dia., with valves, and other specials, for the Urban District Council. Mr. J. O. Parry, consulting civil engineer, Ammanford.

Company Reports

John Baker & Bessemer, Limited.—A further year's arrears of 6 per cent. preference dividend to June 30, 1933, will be paid at the end of February.

Thomas Bolton & Sons, Limited.—Interim dividend on the ordinary shares for the half-year ended September 30 at the rate of 5 per cent. per annum.

International Combustion, Limited.—A dividend on the 6 per cent. cumulative preference shares for the period from the date of allotment to September 30, 1934, is announced.

Applications for Trade Marks

The following list of applications to register trade marks has been taken from the "Trade Marks Journal":—

"CARFLECO" AND "CARFLECO NONCORR."—Metal goods. Cargo Fleet Iron Company, Limited, South Bank Road, Middlesbrough.

"MAGNUMINIUM."—Unwrought and partly wrought non-ferrous metals. Magnesium Castings & Products, Limited, 77-78, Buckingham Avenue, Trading Estate, Slough.

"THRAPSTON."—Machine pulleys. Smith & Grace Screw Boss Pulley Company, Limited, Nene Side Ironworks, Midland Road, Thrapston, Kettering.

"FERRONICRALA."—Steel alloys. National Steel Foundry (1914), Limited, Kirkland Works, Leven, Fife.

"MESHACH."—All goods included in Class 5. Head, Wrightson & Company, Limited, Teesdale Iron Works, Thornaby-on-Tees.

Application to the Cutlers' Company, Sheffield.

"DIAMET."—Steel. Samuel Fox & Company, Limited, Stocksbridge Works, Stocksbridge.

Personal

MR. G. W. VICKERS, general manager of the Sheffield Testing Works, Limited, has been elected to a seat on the board of the company.

MR. J. TENNENT, managing director of Messrs. R. B. Tennent, Limited, Whifflet Foundry, Coatbridge, is going to the United States on business purposes.

MR. ROY STUBBS, President of the Institute of British Foundrymen, has been elected Vice-President of the Manchester and District Ironfounders' Employers' Association.

COLONEL CHARLES F. HITCHINS, D.S.O., has been elected to the board of the Skinningrove Iron Company, Limited, to fill the vacancy caused by the retirement of Mr. Claud E. Pease.

MR. NICHOLAS CURRY, works manager of Holman Bros., Limited, engineers and founders, Camborne, has left Cornwall on a business trip to South Africa, and will be away four or five months.

THE JAMES WATT anniversary lecture has been delivered in the Watt Hall, Greenock, by Dr. Cecil R. Desch, D.Sc., Ph.D., F.R.S., Superintendent of the Metallurgical Department of the National Physical Laboratory, Teddington. His subject was "Metallurgical Research and Engineering."

A BRONZE PLAQUE has been erected to the memory of the late managing directors of Messrs. Shanks & Company, Limited, Barrhead. The unveiling of the plaque in the offices of the firm was performed by Mr. James Reid, one of the oldest foremen in the firm's employ, and Mr. Gilbert M. Shanks, one of the joint managing directors, accepted it on behalf of the board of directors. Mr. John Shanks died in 1919, and Mr. William Shanks ten years later. They were the joint managing directors of the company for many years. Mr. William Shanks was an active member of the National Light Castings Association.

Davy Bros., Limited

The petition of the Glanmor Foundry Company, Limited, of Llanelly, for the compulsory winding-up of Messrs. Davy Bros., Limited, Park Ironworks, Sheffield, again came up for hearing in the Chancery Division last week, before Mr. Justice Bennett.

For the company, it was stated that the petition had been adjourned on numerous occasions with a view to a reconstruction scheme being brought forward. A financial house was willing to provide money if the scheme was approved. A scheme had now been formulated, and a month's adjournment was asked for to enable it to be put into proper shape and for meetings to be convened to consider it.

Mr. Justice Bennett granted an adjournment for four weeks, but said that if the scheme was not then ready he would wind up the company.

Forthcoming Events

The Institute of British Foundrymen

JANUARY 26

East Midlands Branch:—"Rotary Furnaces," Paper by W. Scott, at the Technical College, Derby, at 6 p.m.

Newcastle-upon-Tyne Branch:—"Commercial Moulding-Sand Control for the Tyneside Founder," Paper by F. Hudson, at the Neville Hall, Westgate Road, Newcastle-upon-Tyne, at 6.15 p.m.

Scottish Branch:—"The Use of Sodium Carbonate in the Iron and Steel Industries," Paper by N. L. Evans, B.Sc., A.I.C., at the Heriot-Watt College, Chamber Street, Edinburgh, at 4 p.m.

Wales and Monmouth Branch:—"Loam Moulding," Paper by J. J. McClelland, at the Merchant Venturers' Technical College, Bristol, at 6.30 p.m.

FEBRUARY 2.

Lancashire Branch:—Annual dinner.

Falkirk Section:—"Modern Sand Control in the Foundry," Paper by H. Cowan, B.Sc., at Lint Riggs, Falkirk, at 6 p.m.

The Institute of Vitreous Enamellers

JANUARY 25.

Birmingham:—"Frit Kilns," Paper by J. H. Davidson, M.Sc., at the Chamber of Commerce, New Street, Birmingham, at 7.30 p.m.

JANUARY 28.

London:—"Some Aspects of Plant, Lay-out and Production," Paper by J. T. Gray, at British Industries House, Marble Arch, London, W.1, at 8 p.m.

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Type No. 87 "Plus" Chipper with outside trigger handle.

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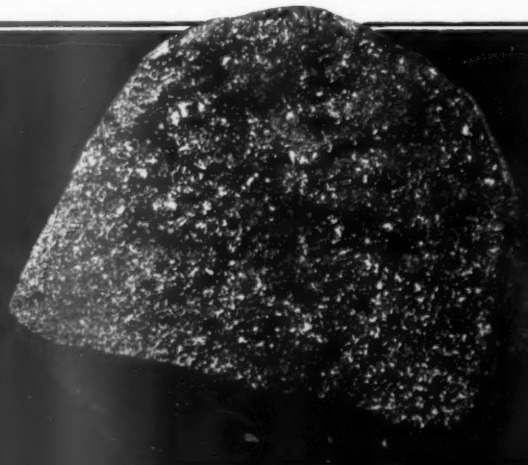

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PIG IRON

Raw Material Markets

Good progress has been made in the iron and steel industry since the opening of the New Year, and confidence in the future is undiminished. More shipbuilding orders have been booked, considerable railway business is expected to be placed shortly, and the loosening of Government credit will mean a considerable increase in the amount of municipal work available for foundries, engineering firms, etc., as compared with recent years.

Pig-Iron

MIDDLESBROUGH.—Activity in the Cleveland iron trade showed a falling off, but this proved to be only a temporary phase. Consumers in general are known to be busily occupied, and have only moderate stocks at their disposal. In the meantime, a certain amount of iron has had to be put into stock. Prices remain at the levels which have prevailed for about the last twelve months. The quotations for No. 3 Cleveland G.M.B. foundry pig are still 67s. 6d. per ton delivered Middlesbrough, 69s. 6d. delivered North-East Coast, 67s. 3d. delivered Falkirk, and 70s. 3d. delivered Glasgow. Half-a-crown per ton extra is charged for No. 1 Cleveland foundry iron, and No. 4 foundry and No. 4 forge are both charged 1s. per ton less than No. 3.

The East Coast hematite makers, with heavy bookings from home consumers and a reviving export demand, are well placed. With output so heavy, however, they would welcome further long-term contracts, which they are confident will be forthcoming shortly. The delivered prices of No. 1 quality in the various zones are as follow:—Middlesbrough, 69s. per ton; North-East Coast, 71s.; Scotland, 75s.; Yorkshire, 75s. to 78s.; Lancashire, 76s.; Birmingham, 79s. per ton.

LANCASHIRE.—Activity at the foundries in this area has slowly returned to normal, and there is a steady demand for common Midland grades of iron. The demand for Scottish makes in this district, however, remains on a disappointing scale, due to the keen competition of Indian iron, supplies of which are going into consumption in local foundries at from 5s. to 7s. 6d. per ton below the current quotations for Scottish brands. The pig-iron market keeps steady, with offers of Staffordshire and Derbyshire No. 3 foundry iron all on the basis of 74s. per ton for delivery to Lancashire users, with Northants at 72s. 6d., Scottish No. 3 at about 82s. 6d., West Coast hematite at about 78s. 6d., and East Coast at from 75s. to 76s., according to grade.

MIDLANDS.—There is a steady call for pig-iron from the engineering trades in this area. The small foundries making light castings are also generally busy, but some of the large concerns have had to limit deliveries of iron, and they are anxiously awaiting a recovery in the demand for repetition castings for the building trade. There have been no changes in the prices of any type of iron. The Midland brands, which are controlled, remain at 67s. 6d. per ton for Northants No. 3 and 71s. per ton for Derbyshire, Lincolnshire and North Staffordshire No. 3, delivered Birmingham and Black Country stations, and subject to rebate to large consumers under certain conditions. The engineering irons vary in price considerably, according to analysis and the districts from which they emanate. Low-phosphorus irons, including Scottish No. 3, range from 85s. to 87s. 6d., medium-phosphorus pig from 72s. to 80s., and refined iron from £5 7s. 6d. to £6 10s. or more.

SCOTLAND.—Dealing in pig-iron on the Glasgow market has been of a limited nature. There is only a poor demand for Scottish iron, and a blast furnace has been put out of commission, whilst the light-castings foundries, which are busily engaged, are amply covered for supplies of English iron. Prices are as follow:—Scottish No. 3, 70s. per ton; No. 1, 72s. 6d. per ton, both f.o.t. furnaces; Cleveland No. 3, 67s. 3d. f.o.t. Falkirk, and 70s. 3d. f.o.t. Glasgow; other English irons, 1s. 3d. per ton less.

Coke

The foundry-coke ovens are well booked over the winter months, and the market has a very firm tone. Current quotations for delivery in the Birmingham area are:—Best Durham coke, 36s. to 40s.; Welsh 35s. to 45s.; Scottish low-ash coke, 40s. to 41s. per ton.

Steel

Quieter conditions rule in the steel markets, but this is not surprising in view of the active buying which has taken place recently. Many of the large consumers and stockholders have covered their requirements for some time ahead, and one of the satisfactory features of the position is that specifications against these contracts are coming forward with regularity. Deliveries in most departments are on a heavy scale, and the market has lost none of the confidence with which the New Year was started. New business in semi-finished steel materials has been on a restricted scale for some weeks owing to a number of the more important consumers having ensured their supplies for some time to come. Lately, however, more inquiry has made its appearance and buyers have shown rather more interest in the market. Business in finished steel has made steady progress and most of the departments are well employed. The export markets are showing more life than for some time past, but trading in a number of oversea countries is still difficult owing to currency and other restrictions.

Scrap

In the Cleveland district there is a good demand for machinery cast-iron scrap, and the price has risen to 55s. Good cast-iron foundry scrap has risen to 53s. 6d. per ton. In the Midlands there is a steady demand for cast-iron scrap, and prices remain at the levels which have ruled for many months, *i.e.*, 55s. for heavy machinery in cupola sizes, 50s. for good heavy, and 47s. 6d. for clean light scrap, all delivered works. In South Wales there is only a limited demand for good cast-iron machinery scrap in foundry sizes, which is quoted at 55s. per ton. The same grade is also quoted at 55s. per ton in the Scottish market.

Metals

Imports of unwrought copper into the United Kingdom during 1934 totalled 250,986 tons (142,147 tons in 1933), of unwrought tin 10,248 (3,427) tons, of crude zinc 131,058 (82,821) tons, and of pig-lead 313,063 (281,509) tons.

Copper.—The copper market at the moment is in a very sensitive state, in the absence of any definite news regarding the preliminary negotiations for a world copper conference. For the moment prices are fairly firm, but the immediate outlook is very uncertain. The possibility of a revaluation of the dollar also led to some nervousness. The demand from industrial consumers in this country has been maintained at a satisfactory level. Copper consumption in the United States is also stated to have expanded slightly.

Daily quotations :—

Cash.—Thursday, £27 13s. 9d. to £27 15s.; Friday, £28 2s. 6d. to £28 3s. 9d.; Monday, £28 6s. 3d. to £28 7s. 6d.; Tuesday, £28 3s. 9d. to £28 5s.; Wednesday, £28 1s. 3d. to £28 2s. 6d.

Three Months.—Thursday, £28 1s. 3d. to £28 2s. 6d.; Friday, £28 10s. to £28 11s. 3d.; Monday, £28 12s. 6d. to £28 13s. 9d.; Tuesday, £28 8s. 9d. to £28 10s.; Wednesday, £28 6s. 3d. to £28 7s. 6d.

Tin.—Prices of this metal have lately displayed irregularity, but firmed up considerably two or three days ago. There is still an unusually large backwardation between prices of spot and three months' metal.

Messrs. Rudolf Wolff report that "trade demand in this country continues satisfactory, with a moderate activity being reported in the Welsh tinplate trade. On the Continent, a fair inquiry is experienced and in the U.S.A. some improvement is reported, with anticipations of some further expansion in consumption."

Market fluctuations :—

Cash.—Thursday, £230 15s. to £230 17s. 6d., Friday, £231 to £231 10s.; Monday, £232 12s. 6d. to £232 15s.; Tuesday, £232 5s. to £232 12s. 6d.; Wednesday, £232 7s. 6d. to £232 10s.

Three Months. — Thursday, £228 15s. to £228 17s. 6d.; Friday, £228 15s. to £229; Monday, £228 17s. 6d. to £229; Tuesday, £228 17s. 6d. to £229; Wednesday, £228 17s. 6d. to £229.

Spelter.—The position regarding the import duty on non-Empire spelter is being reviewed by the Import Duties Advisory Committee, and buyers are inclined to await the Committee's verdict before committing themselves heavily.

"The slight increase in activity which appeared to be imminent has not materialised and galvanisers are again suffering from lack of orders. The Zinc Cartel has now definitely come to an end, but this fact had already been discounted and has not caused the price to change," report Messrs. Brandeis, Goldschmidt.

Official quotations :—

Ordinary.—Thursday, £11 18s. 9d.; Friday, £11 18s. 9d.; Monday, £12; Tuesday, £11 18s. 9d.; Wednesday, £11 18s. 9d.

Lead.—There has been no change in conditions affecting the lead market, and prices have remained low.

Day-to-day prices :—

Soft Foreign (Prompt).—Thursday, £10 5s.; Friday, £10 5s.; Monday, £10 10s.; Tuesday, £10 8s. 9d.; Wednesday, £10 8s. 9d.

Alloyed Castings: Technical Session in Berlin

The chief technical committee for foundry practice (Technischer Hauptausschuss für das Giessereiwesen) has taken up the problem of economy in alloying metals added to castings. This subject will be discussed on Saturday, January 26, at a meeting of the committee, to be held in the Ingenieurhaus, Berlin, when Prof. Dr.-Ing. Piwowarsky will read a report on the International Foundrymen's Congress held at Philadelphia last year and describe outstanding advances in foundry practice in the United States. The question of economising alloying elements will be dealt with by Dr.-Ing. Jungbluth and Dr.-Ing. Matejka, and will be followed by a statement on raw materials supplies to foundries by a representative of the Gesamtverband deutscher Metallgiessereien. Prof. Dr.-Ing. Thum as rapporteur will report on the progress made in research on casting and welding. Dr. Rall will read a report dealing with the use of rejected alloy castings and steel scrap. Representatives from the leading German foundry trade organisations will be present and interesting discussions are expected to follow the presentation of the reports.

Patent Specifications Accepted

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each. The numbers given are those under which the Specifications will be printed and abridged, and all subsequent proceedings will be taken.

418,772. OESTERREICHISCHE DYNAMIT NOBEL AKT.-GES. Corrosion-resisting and mechanically-workable alloys.

418,808. WILLIAMS, G. Casting of metals.

418,817. GENERAL ELECTRIC COMPANY, LIMITED. NUNN, C. H., and STOBIE, V. Induction furnace arrangements.

418,873. COTTERILL, W. Manufacture and production of malleable iron.

418,994. THORNTON, A. A. (Vereinigte Stahlwerke Akt.-Ges.). Process of removing rust from and pickling iron and steel.

419,487. WALTERS, E. A. Rust-preventing composition and method of making the same.

419,499. METALLGES. AKT.-GES. Process for utilising the heat of furnace gases from pyrites burners.

419,621. HATFIELD, W. H., and BRIDGE, J. F. Alloy steels, particularly for cold-drawing dies.

419,654. FOUNDRY EQUIPMENT, LIMITED (Baillot, A. J.). Foundry moulding machines.

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RAW MATERIALS—PRICE LIST

(Wednesday, January 23, 1935)

COPPER

	£	s.	d.
Standard cash	28	1	3
Three months	28	6	3
Electrolytic	31	0	0
Tough	30	0	0
Best selected	30	10	0
Sheets	58	0	0
India	41	15	0
Wire bars	31	12	6
Ingot bars	31	12	6
H.C. wire rods	34	7	6
Off. av. cash, December	27	17	6 15/19
Do., 3 mths., December	28	5	4 1/10
Do., Sttlmnt., December	27	17	10 1/2
Do., Electro, December	31	6	4 11/19
Do., B.S., December	31	0	7½
Do., wire bars, December	31	11	0 12/19
Solid drawn tubes			9½d.
Brazed tubes			9½d.
Wire			6d.

BRASS

Solid drawn tubes	8½d.
Brazed tubes	10½d.
Rods, drawn	8d.
Rods, extd. or rlld.	4½d.
Sheets to 10 w.g.	7½d.
Wire	7d.
Rolled metal	6½d.
Yellow metal rods	4½d.
Do. 4 × 4 Squares	5½d.
Do. 4 × 3 Sheets	5½d.

TIN

	£	s.	d.
Standard cash	232	7	6
Three months	228	17	6
English	232	12	6
Bars	234	12	6
Straits (nom.)	232	5	0
Australian (nom.)			—
Eastern	232	12	6
Banca (nom.)	235	5	0
Off. av. cash, December	228	5	1 1/10
Do., 3 mths., December	228	11	7 14/19
Do., Sttlmt., December	228	5	0

SPELTER

	£	s.	d.
Ordinary	11	18	9
Remelted	13	5	0
Hard	10	15	0
Electro 99.9	14	11	3
English	12	18	9
India	12	5	0
Zinc dust	17	0	0
Zinc ashes	3	0	0
Off. aver., December	11	17	5 3/8
Aver. spot, December	11	14	7 5/19

LEAD

	£	s.	d.
Soft foreign ppt.	10	8	9
Empire (nom.)	11	11	3
English	12	10	0
Off. average, December	10	8	1 17/19
Average spot, December	10	6	3 15/19

ALUMINIUM

Ingots	£100 to £105
Wire	1/1 to 1/9 lb.
Sheet and foil	1/2 to 2/9 lb.

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	23	10	0
Do., V.M. ex whse.	22	12	6
Rods	26	10	0

ANTIMONY

	£	s.	d.	£	s.	d.
English	77	0	0 to	78	0	0
Chinese, ex-whse.			69	10	0	
Crude					—	

QUICKSILVER

	£	s.	d.	£	s.	d.
Quicksilver	11	2	6 to	11	10	0

FERRO-ALLOYS AND STEEL-MAKING METALS

	£	s.	d.	£	s.	d.
Ferro-silicon—						
25%	8	17	6			
45/50%	13	0	0			
75%	18	7	6			
Ferro-vanadium—						
35 50				12/8 lb. Va.		
Ferro-molybdenum—						
70/75% carbon-free				4/6 lb. Mo.		
Ferro-titanium—						
23/25% carbon-free				9d. lb.		
Ferro-phosphorus, 20/25%				£14 10 0		
Ferro-tungsten—						
80/85%				3/- lb.		
Tungsten metal powder—						
98/99%				3/3 lb.		
Ferro-chrome—						
2/4% car.	29	15	0			
4/6% car.	23	0	0			
6/8% car.	21	12	6			
8/10% car.	21	12	6			
Ferro-chrome—						
Max. 2% car.	34	0	0			
Max. 1% car.	38	15	0			
Max. 0.70% car.	42	0	0			
70%, carbon-free	10d. lb.					
Nickel—99.5/100%	£200 to £205					
"F" nickel shot	£184	0	0			
Ferro-cobalt, 98/99%	5/3 lb.					
Metallic chromium—						
96/98%	2/5 lb.					
Ferro-manganese (net)—						
76/80% loose	£10 15 0 to £11	5	0			
76/80% packed	£11 15 0 to £12	5	0			
76/80% export (nom.)	£9 15	0				
Metallic manganese—						
94/96% carbon-free	1/2 lb.					

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL

Finished bars, 14% tungsten	2s. 0d.
Finished bars, 18% tungsten	2s. 9d.

Per lb. net, d/d buyers' works.

Extras—

Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under ½ in. to ¼ in.	3d. lb.
Do., under ¼ in. to 1/16 in.	1/- lb.
Flats, ½ in. × ¼ in. to under 1 in. × ⅛ in.	3d. lb.
Do., under ¼ in. × ¼ in.	1/- lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra.

SCRAP

	£	s.	d.	£	s.	d.
South Wales—						
Heavy steel	2	15	0 to	2	16	0
Bundled shrngs.				2	7	6
Mixed iron and steel	2	10	0 to	2	12	6
Heavy cast iron	2	10	0 to	2	12	6
Good machinery				2	15	0
Cleveland—						
Heavy steel				2	12	0
Steel turnings				1	15	0
Cast-iron borings				1	5	0
Heavy cast iron				2	12	6
Heavy machinery				2	13	6
Midlands—						
Light cast-iron scrap				2	7	6
Heavy wrought iron				3	0	0
Steel turnings, f.o.r.				1	14	0
Scotland—						
Heavy steel				2	10	0
Ordinary cast iron	2	10	0 to	2	12	6
Engineers' turnings				2	0	0
Cast-iron borings	1	17	6 to	1	19	0
Wrought-iron piling				2	12	6
Heavy machinery				2	15	0

London—Merchants' buying prices, delivered yard.

	£	s.	d.
Copper (clean)	25	0	0
Brass	16	10	0
Lead (less usual draft)	9	10	0
Tea lead	6	10	0
Zinc	8	0	0
New aluminium cuttings	66	0	0
Braziery copper	20	0	0
Gunmetal	23	0	0
Hollow pewter	160	0	0
Shaped black pewter	118	0	0

PIG-IRON

N.E. Coast (d/d Tees-side area)—	
Foundry No. 1	70/-
Foundry No. 3	67/6
,, at Falkirk	67/3
,, at Glasgow	70/3
Foundry No. 4	66/6
Forge No. 4	66/6
Hematite No. 1	69/-
Hematite M/Nos.	68/6
N.W. Coast—	
Hem. M/Nos. d/d Glas.	72/6
,, d/d Birm.	84/6
Malleable iron d/d Birm.	115/-
Midlands (d/d Birmingham dist.)—	
Staffs No. 4 forge	67/-
,, No. 3 fdry.	71/-
Northants forge	63/6
,, fdry. No. 3	67/6
,, fdry. No. 1	70/6
Derbyshire forge	67/-
,, fdry. No. 3	71/-
,, fdry. No. 1	74/-
Scotland—	
Foundry No. 1, f.o.t.	72/6
,, No. 3, f.o.t.	70/-
Hem. M/Nos. d d	71/-
Sheffield (d/d district)—	
Derby forge	64/6
,, fdry. No. 3	68/6
Lincs forge	64/6
,, fdry. No. 3	68/6
E.C. hematite	81/6
W.C. hematite	83/6
Lancashire (d/d eq. Man.)—	
Derby fdry. No. 3	74/-
Staffs fdry. No. 3	74/-
Northants fdry. No. 3	72/6
Cleveland fdry. No. 3	74/-
Dalzell, No. 3 (special)	102/6 to 105/-
Glengarnock, No. 3	82/6
Clyde, No. 3	82/6
Monkland, No. 3	82/6
Summerlee, No. 3	82/6
Eglinton, No. 3	82/6
Gartsherrie, No. 3	82/6
Shotts, No. 3	82/6

FINISHED IRON AND STEEL

Usual district deliveries for iron; delivered consumer's station for steel.

	£	s.	d.	£	s.	d.
Iron—						
Bars (cr.)	9	12	6 to	9	15	0
Nut and bolt iron	7	10	0 to	8	0	0
Hoops	10	10	0 and up.			
Marked bars (Staffs) f.o.t.	12	0	0			
Gas strip	10	10	0 and up.			
Bolts and nuts, ¾ in. × 4 in.	14	0	0 and up.			
Steel—						
Plates, ship, etc.	8	15	0 to	8	17	6
Boiler plts.	9	5	0 to	9	7	6
Chequer plts.	10	7	6			
Angles	8	7	6			
Tees	9	7	6			
Joists	8	15	0			
Rounds and squares, 3 in. to 5½ in.	9	7	6			
Rounds under 3 in. to ¾ in. (Untested)	8	12	0			
Flats—8 in. wide and over	8	12	6			
,, under 8 in. and over 5 in.	8	17	6			
Rails, heavy	8	5	0 to	8	10	0
Fishplates	12	5	0 to	12	10	0
Hoops (Staffs)	9	7	0			
Black sheets, 24g. (4-t. lots)	10	10	0			
Galv. cor. shts. (,,)	13	0	0			
Galv. flat shts. (,,)	13	10	0			
Galv. fencing wire, 8g. plain	14	10	0			
Billets, soft	5	10	0 and up.			
Billets, hard	6	17	6 to	7	2	6
Sheet bars	5	0	0 to	5	7	6
Tin bars	5	2	6 to	5	7	6

PHOSPHOR BRONZE

	Per lb. basis.
Strip	9d.
Sheet to 10 w.g.	10d.
Wire	11d.
Rods	10d.
Tubes	13d.
Castings	10½d.

Delivery 3 cwt. free.
10% phos. cop. £30 above B.S.
15% phos. cop. £35 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. CLIFFORD & SON, LIMITED.

NICKEL SILVER, &c.

	Per lb.
Ingots for raising	7d. to 1/1
Rolled—	
To 9 in. wide	1/1 to 1/7
To 12 in. wide	1/1½ to 1/7½
To 15 in. wide	1/1½ to 1/7½
To 18 in. wide	1/2 to 1/8
To 21 in. wide	1/2½ to 1/8½
To 25 in. wide	1/3 to 1/9
Ingots for spoons and forks	7d. to 1/3½
Ingots rolled to spoon size	10d. to 1/6½
Wire round—	
to 10g.	1/4½ to 1/11½

with extras according to gauge.
Special 5ths quality turning rods in straight lengths, 1/3½ upwards.

AMERICAN IRON AND STEEL

At Pittsburgh unless otherwise stated.

	Dols.
No. 2 foundry, Phila.	20.26
No. 2 foundry, Valley	18.50
No. 2 foundry, Birm.	14.50
Basic, Valley	18.00
Bessemer	20.76
Malleable, Valley	18.50
Grey forge, Valley	18.00
Ferro-mang. 80%, seaboard	85.00
O.-h. rails, h'y, at mill	36.37½
Billets	27.00
Sheet bars	28.00
Wire rods	38.00
	Cents.
Iron bars, Chicago	1.80
Steel bars	1.80
Tank plates	1.80
Beams, etc.	1.80
Skelp, grooved steel	1.70
Steel hoops	2.10
Sheets, black, No. 24	2.40
Sheets, galv., No. 24	3.10
Wire nails	2.60
Plain wire	2.30
Barbed wire, galv.	3.00
Tinplates, 100-lb. box	$5.25

COKE (at ovens)

Welsh foundry	25/- to 30/-
,, furnace	19/- to 20/-
Durham foundry	20/- to 25/-
,, furnace	17/6
Midlands, foundry	—
,, furnace	—

TINPLATES

f.o.b. Bristol Channel ports.

I.C. cokes	20×14 per box	18/2 to 18/6
,,	28×20 ,,	36/4 to 37/-
,,	20×10 ,,	26/- to 26/3
,,	18¾×14 ,,	18/6 to 18/9
C.W.	20×14 ,,	15/6 to 16/6
,,	28×20 ,,	33/- to 33/6
,,	20×10 ,,	23/- to 24/-
,,	18¾×14 ,,	16/- to 17/-

SWEDISH CHARCOAL IRON & STEEL

	£	s.	d.	£	s.	d.
Pig-iron	£6	0	0 to	£7	0	0
Bars-hammered, basis	£16	0	0 to	£16	10	0
Bars and nail-rods, rolled, basis	£15	15	0 to	£16	0	0
Blooms	£10	0	0 to	£12	0	0
Keg steel	£30	0	0 to	£31	0	0
Faggot steel	£18	0	0 to	£23	0	0
Bars and rods dead soft, st'l	£10	0	0 to	£12	0	0

All per English ton, f.o.b. Gothenburg.
[Subject to an exchange basis of Kr. 18.16 to £1.]

DAILY FLUCTUATIONS

Standard Copper (cash)

		£	s.	d.	
Jan.	17 ..	27	13	9	dec. 2/6
,,	18 ..	28	2	6	inc. 8/9
,,	21 ..	28	6	3	,, 3/9
,,	22 ..	28	3	9	dec. 2/6
,,	23 ..	28	1	3	,, 2/6

Electrolytic Copper

		£	s.	d.	
Jan.	17 ..	31	0	0	No change
,,	18 ..	31	10	0	inc. 10/-
,,	21 ..	31	10	0	No change
,,	22 ..	31	5	0	dec. 5/-
,,	23 ..	31	0	0	,, 5/-

Standard Tin (cash)

		£	s.	d.	
Jan.	17 ..	230	15	0	inc. 10/-
,,	18 ..	231	0	0	,, 5/-
,,	21 ..	232	12	6	,, 32/6
,,	22 ..	232	5	0	dec. 7/6
,,	23 ..	232	7	6	inc. 2/6

Tin (English ingots)

		£	s.	d.	
Jan.	17 ..	230	17	6	inc. 5/-
,,	18 ..	231	7	6	,, 10/-
,,	21 ..	232	17	6	,, 30/-
,,	22 ..	232	12	6	dec. 5/-
,,	23 ..	232	12	6	No change

Spelter (ordinary)

		£	s.	d.	
Jan.	17 ..	11	18	9	inc. 1/3
,,	18 ..	11	18	9	No change
,,	21 ..	12	0	0	inc. 1/3
,,	22 ..	11	18	9	dec. 1/3
,,	23 ..	11	18	9	No change

Spelter (Electro, 99.9 per cent.)

		£	s.	d.	
Jan.	17 ..	14	11	3	inc. 1/3
,,	18 ..	14	11	3	No change
,,	21 ..	14	12	6	inc. 1/3
,,	22 ..	14	11	3	dec. 1/3
,,	23 ..	14	11	3	No change

Zinc Sheets (English)

		£	s.	d.	
Jan.	17 ..	23	10	0	No change
,,	18 ..	23	10	0	,, ,,
,,	21 ..	23	10	0	,, ,,
,,	22 ..	23	10	0	,, ,,
,,	23 ..	23	10	0	,, ,,

Lead (English)

		£	s.	d.	
Jan.	17 ..	12	10	0	No change
,,	18 ..	12	10	0	,, ,,
,,	21 ..	12	10	0	,, ,,
,,	22 ..	12	10	0	,, ,,
,,	23 ..	12	10	0	,, ,,

AVERAGE MONTHLY PRICES OF FURNACE COKE D/D MIDDLESBROUGH

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Yearly average.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1902	0 16 9	0 15 0	0 15 6	0 15 0	0 15 0	0 15 3	0 15 3	0 15 3	0 15 6	0 16 0	0 16 6	0 16 0	0 15 5
1903	0 15 9	0 16 0	0 16 3	0 16 9	0 16 6	0 16 3	0 16 0	0 15 9	0 15 6	0 15 0	0 14 6	0 14 0	0 15 8½
1904	0 13 9	0 13 9	0 13 3	0 14 3	0 14 6	0 14 3	0 14 3	0 14 3	0 14 3	0 14 0	0 14 0	0 14 6	0 14 1½
1905	0 14 9	0 15 3	0 15 3	0 15 3	0 15 6	0 15 6	0 15 6	0 15 6	0 15 6	0 15 6	0 15 9	0 17 0	0 15 5½
1906	0 17 6	0 17 6	0 17 0	0 17 0	0 17 0	0 16 6	0 17 0	0 17 0	0 18 3	0 18 6	0 19 0	1 0 0	0 17 8½
1907	1 4 6	1 5 0	1 5 0	1 0 6	1 2 0	1 1 0	1 1 0	1 1 0	1 2 0	1 1 6	1 0 0	0 17 0	1 1 8½
1908	0 16 0	0 16 0	0 15 6	0 16 0	0 16 3	0 16 0	0 15 6	0 15 6	0 15 6	0 15 3	0 16 0	0 16 0	0 15 9½
1909	0 16 0	0 15 3	0 15 0	0 14 9	0 15 6	0 15 9	0 15 6	0 15 6	0 16 6	0 17 0	0 17 6	0 17 0	0 15 11½
1910	0 18 4½	0 18 6½	0 18 0	0 18 0	0 17 10½	0 17 0	0 16 1½	0 15 9½	0 15 11	0 16 0	0 15 9½	0 15 8	0 16 11
1911	0 16 0	0 15 10½	0 15 6	0 15 3	0 14 9	0 14 6	0 14 6	0 14 6	0 14 6	0 14 11½	0 15 0½	0 16 3½	0 15 1½
1912	0 17 3	0 17 3	0 18 6	0 18 10	0 19 0	0 19 4½	0 19 10½	1 0 9½	1 2 9	1 4 1½	1 5 8½	1 8 6	1 1 0
1913	1 5 9	1 4 11	1 5 0	1 5 0	1 4 9½	1 0 4½	0 19 5½	0 18 3	0 18 0	0 18 2½	0 18 6	0 18 6	1 1 4½
1914	0 18 2	0 17 1	0 17 0	0 17 0	0 17 4	0 17 6	0 17 6	0 18 5	0 18 4	0 17 9	0 17 6	0 18 5	0 17 8
1915	0 17 10½	0 17 9	1 0 4½	1 7 7½	1 9 4½	1 10 7½	1 9 7	1 7 3	1 5 4	1 4 9	1 9 6	1 13 0	1 6 1
1916	1 10 9	1 10 6	1 10 6	1 10 6	1 10 6	1 10 6	1 10 6	1 10 6	1 10 6	1 10 6	1 10 6	1 10 6	1 10 6½
1917	1 10 6	1 10 6	1 10 6	1 10 6	1 10 6	1 10 6	1 10 6	1 10 6	1 10 6	1 10 6	1 14 3	1 15 8	1 11 9½
1918	1 15 6	1 15 6	1 15 6	1 15 6	1 15 6	1 15 6	1 15 6	1 15 6	1 15 6	1 15 6	1 15 6	1 15 6	1 15 6
1919	1 15 6	1 15 6	1 15 6	2 1 6	2 1 6	2 3 9	2 3 9	2 10 6	2 10 6	2 10 6	2 10 6	2 10 6	2 3 5
1920	2 12 3	2 14 0	2 19 0	2 19 0	3 3 8	3 6 0	3 6 0	3 6 0	3 6 0	3 6 0	3 6 0	3 6 0	3 2 6
1921	3 1 0½	2 19 0	2 16 0	2 7 0	2 6 6	2 6 6	2 0 6	2 0 0	1 13 11	1 12 9	1 10 4½	1 8 3	2 3 6½
1922	1 7 0½	1 8 1½	1 9 7½	1 8 4½	1 7 11½	1 7 3	1 6 9½	1 6 10½	1 7 0½	1 10 2½	1 10 0	1 9 11½	1 8 3½
1923	1 11 3	1 14 6	2 0 1½	2 2 8½	2 4 4½	2 2 10½	2 1 0½	2 1 6	2 0 9½	1 18 9	1 18 8½	1 18 3	1 19 7½
1924	1 16 6½	1 14 9	1 11 11½	1 10 0½	1 8 1½	1 7 8½	1 7 3	1 6 3	1 6 0	1 5 0	1 5 0	1 5 0	1 9 5½
1925	1 4 10½	1 4 1½	1 13 3	1 2 4½	1 2 2½	1 1 5½	1 1 3½	1 4 9	0 18 10½	0 18 4½	0 19 6½	1 1 4½	1 2 8½
1926	1 2 1½	1 0 9	0 19 2½	0 18 6½	*	*	*	*	*	*	*	1 5 0	1 1 1½‖
1927	1 5 6	1 4 9½	1 6 1½	1 3 9	1 2 6	1 0 8½	0 19 4½	0 19 0	0 18 7½	0 18 0	0 17 10½	0 17 6	1 1 1½
1928	0 17 6	0 17 10½	0 18 0½	0 17 11½	0 17 8½	0 17 6½	0 17 7½	0 17 6½	0 17 6	0 17 7½	0 17 7½	0 17 6	0 17 8
1929	0 17 7½	0 18 0	0 19 0	0 19 6½	0 18 10½	0 19 10½	1 1 3½	1 1 8½	1 3 0	1 3 6	1 3 8	1 3 1½	1 0 9½
1930	1 2 6½	1 1 3	1 0 3	0 19 1½	0 17 7	0 16 10½	0 16 6	0 16 6	0 16 9	0 17 0	0 17 0	0 17 0	0 18 2½
1931	0 17 0	0 16 7½	0 16 0	0 16 0	0 15 11	0 15 5	0 15 1	0 15 0	0 15 0	0 16 9	0 17 0	0 16 6	0 16 0½
1932	0 17 0	0 16 11½	0 16 5½	0 15 9	0 15 7½	0 15 6	0 15 6	0 14 9½	0 14 6½	0 14 6	0 14 6	0 15 4	0 15 6½
1933	0 16 0½	0 15 11½	0 15 6½	0 15 6	0 15 6	0 15 6	0 15 6	0 15 8½	0 16 1½	0 17 0	0 17 6	0 18 0	0 16 1½
1934	0 19 1½	1 0 6	1 0 2	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	0 19 11½

* Strike period. ‖ Five months.

WILLIAM JACKS & COMPANY,
WINCHESTER HOUSE, OLD BROAD ST., LONDON, E.C.2.

CLARENCE CHAMBERS, 39, CORPORATION STREET, BIRMINGHAM.
13, RUMFORD STREET, LIVERPOOL.

PIG IRON

REGISTERED TRADE MARK
LIMPET

All grades FOUNDRY, HEMATITE, BASIC, SPECIALS, &c.

NON-FERROUS METALS

COPPER, TIN, LEAD, SPELTER, ANTIMONY, CHROME ORE.

WILLIAM JACKS & COMPANY,
CENTRAL CHAMBERS, 93, HOPE ST., GLASGOW, C.2.
ZETLAND ROAD, MIDDLESBROUGH.

XUM

Notice

Small Advertisements in this section of the Journal are accepted at the prepaid rate of 6d. per line, first line in capitals counting two, average 6 words per line. Minimum charge for one insertion 3/-

(A remittance should accompany instructions.)

SITUATIONS VACANT AND WANTED

ADVERTISER wants position as Foundry Works Manager or Foundry Superintendent with sole charge engaged in motor-car work or similar class of work, either alum. or iron or both. Up-to-date production in large quantities by machine, both moulding and cores. Able to introduce business. Guarantee results.—Box 106, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

FOUNDRY Foreman seeks position; 17 years' experience with high-class work in ferrous and non-ferrous pressure castings; accustomed to modern plant, repetition work, moulding machines.—Box 118, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

FOUNDRY Manager, qualified Metallurgist (young), desires change; experienced production alloy cast iron and steel, brass and bronze castings for marine Diesel and motor-car engines, general engineering and electrical trades; sound knowledge up-to-date production methods; accustomed control electric arc, air and cupola furnaces; able to introduce business.—Box 120, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

STEEL-FOUNDRY Metallurgist desires change; 16 years' experience production of all classes engineering castings; specialist in electric-furnace work; sound knowledge of sand control, also costing and estimating; capable of taking complete charge steel foundry.—Box 124, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

WORKS Manager and fully-qualified Chemist, with many years' management experience in manufacture and application of all classes of vitreous enamels, specialised in acid-proof enamels, requires change of appointment. Suitable post abroad not refused.—Box 114, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

EMPLOYMENT REGISTER.

Conducted by the Institute of British Foundrymen by courtesy of the proprietors of THE FOUNDRY TRADE JOURNAL.

Correspondence should be addressed to the General Secretary, Institute of British Foundrymen, St. John Street Chambers, Deansgate, Manchester, from whom full particulars can be obtained of this service.

Any employer wishing to communicate with a candidate should write to the General Secretary, quoting identification number.

ASSOCIATE Member, I.B.F., requires position as Chief Accountant or Foundry Cost Accountant. Many years' professional and commercial experience. Incorporated Accountant. (253)

PARTNERSHIP

WANTED, Partner in proposed non-ferrous foundry in E.17 district; experienced Moulder preferred. State age and amount of capital prepared to invest.—A. G., 20, Frances Road, South Chingford, London, E.4.

AGENCY

GENTLEMAN, excellent connection all Scotland and N.E. England, now open to represent good firm, iron, steel, malleable or non-ferrous foundries; trained all departments foundry trade.—Particulars, Box 126, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

AUCTION SALE

Important Notice to Ironfounders, Machinery Merchants, Electrical Engineers, Contractors and others.

By Order of the Receivers for the Debenture Holders, *re* Wm. Hammond & Company (Syston), Limited, Malleable Ironfounders, SYSTON, near LEICESTER.

MR. C. A. CHARLTON, F.A.I., is instructed by the Receivers to SELL BY AUCTION on the premises as above on

JANUARY 29 AND 30, 1935,

the whole of the

HIGH-CLASS IRONFOUNDRY PLANT, MACHINERY AND TOOLS,

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